

**THE ILLUMINATING ENGINEER**

LIGHT  
LAMPS  
FITTINGS  
AND  
ILLUMINATION

**THE JOURNAL OF  
GOOD LIGHTING**

Official Organ of the Illuminating Engineering Society

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Edited by  
**J. STEWART DOW**

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The Annual Meeting of the Illuminating Engineering Society—The Gas Industry and Illuminating Engineering—The International Illumination Congress—Architectural Lighting—Floodlighting in Prague—Lighting at the North-East Coast Exhibition—News from Abroad, etc.

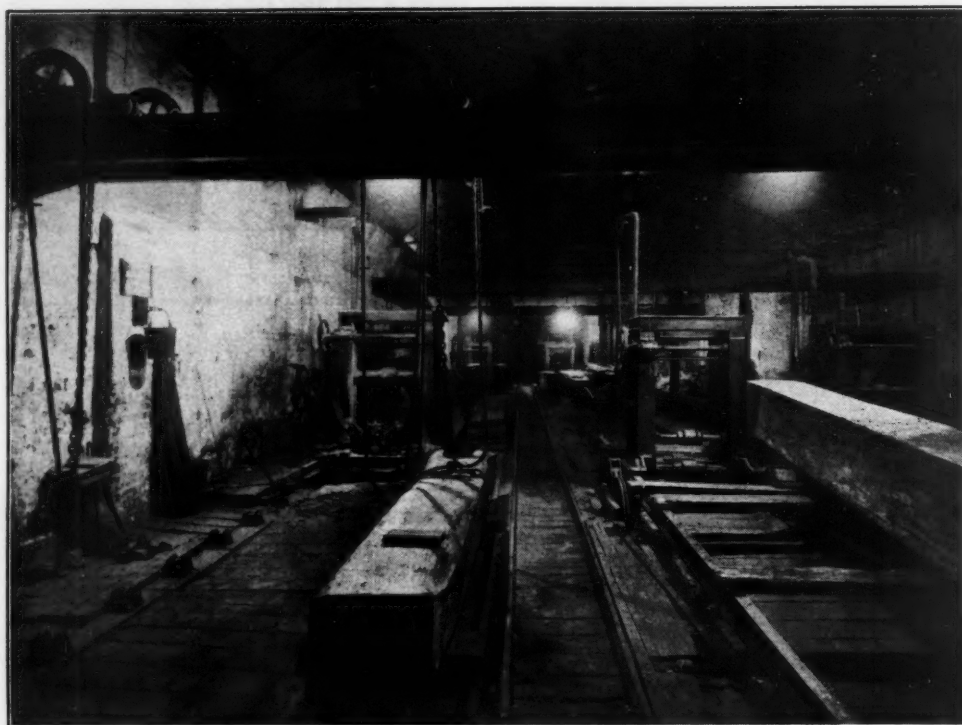
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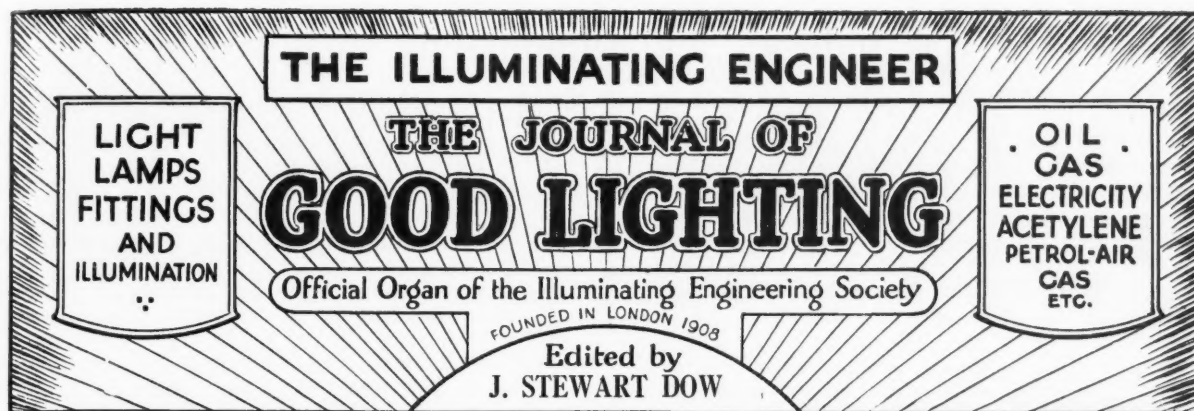
## LIGHTS of LONDON

### No. 5

A night photograph of a sawmill at Stratford, lighted by five 5-light and two 3-light gas lamps with super-heater burners. In view of the dangerous nature of the work, it is essential that the illumination near the saws should be good. For the lighting of the machine to be seen on the left, the 5-light gas lamp is placed 10 feet in front of the machine and 11 feet from the ground. Good illumination is thus provided not only on the cutting edges, but along the whole length of the piece of wood which is to be drawn through the machine and cut up into as many as 48 boards in one operation. Recent tests showed that the illumination at a point near the saws is 4.5 foot-candles.

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## The Illuminating Engineering Society—Another Year's Progress

**M**EMBERS had every reason to be satisfied with the record of progress presented at the annual meeting of the Illuminating Engineering Society on June 4th. The Society has had a series of exceptionally interesting meetings during the past session. Much has been done to place it upon a firm foundation. As will be seen from the statement accompanying the annual report (see p. 166) the affairs of the Society are being put into good order and already the financial position has been much improved. This is due partly to the steady growth in membership, but especially to the contributions of the sustaining members, who have responded generously to the appeal launched last year. Considering the short time that has elapsed since this scheme was initiated a good start has been made. The departure is a useful and important one, not merely because of the financial support it ensures, but because it enables the Society to be definitely linked with all the leading firms in the lighting industry so that it has a convenient means of access to information on technical matters. At present the sustaining members are naturally drawn mainly from firms interested in lighting, but we hope that in course of time important bodies associated with the interests of consumers will be fully represented.

In several other important matters substantial progress has been made. The procedure in regard to elections of officers and council has been regularized by the adoption of new by-laws at the special general meeting on February 19th, which will ensure that at the end of each session the Council receives the desirable influx of "new blood." In addition the somewhat onerous task of preparing a new draft of the Articles and By-laws, in order to enable the Society to become an incorporated body, has been completed; this draft will be presented for the consideration of members at a special general meeting on July 9th.

We have no doubt that members as a whole will feel that this is an excellent record of work accomplished in the short period of about 18 months, since the loss sustained by the Society in the sudden death of its founder early in 1928. In the somewhat difficult period which followed, the Society has been extremely fortunate in having had as its Presidents Mr. D. R. Wilson and Mr. C. C. Paterson, both of whom have shown great sagacity in guiding the Society into smoother waters, and have generously devoted themselves to its welfare.

And now, what of the future? We should like to emphasize one point brought out in the address delivered by the President on June 4th—the exceptionally favourable position in which this country is placed in regard to illuminating engineering. The existing machinery for the study of this subject is very complete and is organized on a sound basis. We have the National Illumination Committee, with its numerous subcommittees, which is the body primarily interested in international aspects. This committee likewise acts as the Sectional Committee of the British Engineering Standards Association, which again is served by numerous subcommittees, to whom are entrusted matters connected with standardization. We have next the Illumination Research Committee operating under the Department of Scientific and Industrial Research, which is able to undertake investigations and research such as could not readily be done by private persons, and the National Physical Laboratory, serving as a centre of research for all the above bodies. Finally we have the Illuminating Engineering Society, whose main function is to provide an impartial platform for the discussion of problems in illuminating engineering, and to act as a centre for the collection and dissemination of information thereon, and such bodies as the E.L.M.A. Service Bureau which also do useful educational work in the more directly commercial and industrial field.

Now if each of these various organizations pursued its own course independently confusion would result. But, very fortunately, they are all closely interlinked, each being strongly represented in the other organizations, so that co-operation is ensured and overlapping avoided. The Illuminating Engineering Society in this country was the first in the field, and it may justly take credit for much of the growth of interest in illumination, out of which these other organizations have sprung. It has no occasion to feel that it has been in any way superseded, for the division of duties is a natural process, and its own members take a leading share in the work of all these other bodies.

These conditions, therefore, are very favourable to continued progress in illuminating engineering. They also afford a sound basis on which to prepare for our next great effort—the International Illumination Congress—which is to be held in this country in 1931, and for which the National Illumination Committee and the Illuminating Engineering Society are already jointly preparing.



## The Gas Industry and Illuminating Engineering

THE annual meeting of the Institution of Gas Engineers was this year an historic one. Mr. John Terrace, the President, was able to exhibit to members the royal charter which had been delivered only a few days before the meeting. The Institution thus starts on a new era in its prosperous career.

As usual the Report of the Council covered a wide range of activities. Special interest attaches to the development of the new educational scheme, with which Mr. F. W. Goodenough has been so closely associated. There were also numerous reports of committees and papers of a technical nature, but, if we except Mr. Watson's useful report on the International Illumination Congress, lighting did not figure largely in the proceedings.

It is, indeed, rare for a paper dealing primarily with illumination to be read before the Institution, though in fact the amount of gas consumed for lighting throughout the country still reaches a prodigious figure, and the lighting load remains a substantial element in the output of leading gas undertakings. It is common knowledge that during recent years the attention of the gas industry has been somewhat diverted from lighting, owing to the general development of cooking and heating. Mr. John Terrace, in his Presidential Address, clearly emphasized the need for more activity in connection with illumination:—

"The advantages of the use of gas for lighting in the house," he said, "do not appear to be sufficiently advocated, and greater efforts should be made to maintain and extend its use in this field. Students at educational classes should also be impressed with the necessity of knowledge of the fundamentals and application of scientific illumination. These are necessary even for domestic lighting, where in many cases the desire for artistic effects predominates over efficiency and utility; but much more so for industrial and street lighting.

"There is also the need of the services of the properly qualified younger members of our profession in the associations connected with illumination, such as the Illuminating Engineering Society and the Association of Public Lighting Engineers. Representatives of the rival illuminants willing to take part in this work seem to be quite numerous; and I appeal to chiefs—many of whom have not themselves the time to spare—who have assistants devoting special attention to such work, to encourage these assistants to become members, and by this means help in maintaining the status of the gas industry. Otherwise our apathy may well, in time, prove greatly to our detriment."

In moving the adoption of Mr. Watson's report, the President again alluded to this matter. He paid a well merited compliment to Mr. Watson for the valuable work which he has done both on behalf of the Institution and in the interests of illumination generally, and he expressed the hope that the Institution would take its rightful place in the International Illumination Congress of 1931 as a very important member of the illumination interests. The same view was expressed by Capt. W. J. Liberty, who remarked that at meetings of the National Illumination Committee and of the Illuminating Engineering Society, which had now taken on a new lease of life, the gas industry is not represented as fully and as actively as it might be.

Mr. Terrace and Mr. Watson based their plea on the wide ground that the old-established and important gas industry cannot afford to stand outside this rapidly extending movement. But even from the purely business standpoint there is every

reason why gas undertakings should take a keen interest in illumination. The desirability of maintaining the lighting load has been frequently urged of late, but it is perhaps not sufficiently recognized that something other than the methods of the past is needed. This point was well expressed in a recent letter to the *Gas World*.\* This contributor suggests that the problem is largely one of education and propaganda. He points to the remarkable training organization already built up by the E.L.M.A. Lighting Service Bureau, with its facilities for demonstration and its staff of lecturers. It is necessary "to train gas salesmen in the science of illuminating engineering, for it is only by improving the knowledge of the selling staff that any progress can be made in the desired direction."

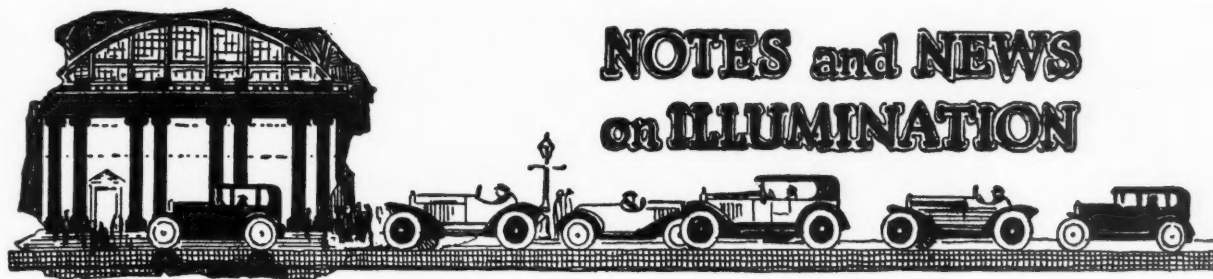
These, be it noted, are the views of a well-wisher to the gas industry. If we are disposed to echo them it is because we, too, are anxious that the gas industry should study illuminating engineering and should not allow lighting to be relegated to the background. We have always shared the view of the enlightened leaders in the gas and electrical industries that there is room for both, and that competition between them has a salutary influence, as well as being in the interests of the consumer. It need not be assumed that each can extend only at the expense of the other. One of the chief lessons of illuminating engineering is that in most fields of operation the amount of artificial light used is still far below what is economically justified and hygienically desirable. But those interested in gas lighting should have the knowledge to apply arguments in favour of better lighting which relate to illumination generally, as well as the technical skill to plan lighting installations which are at once efficient and attractive.

Progress in this direction is largely a matter of education, first as regards the staff and next as regards the public. Gas lighting, quite apart from its value as a load, forms one of the best possible advertisements, keeping gas before the public and reminding them of its other uses. Those associated with the gas industry would therefore do well to encourage distinctive and arresting exhibitions of lighting—in recent years we have had few such demonstrations as those which figured in the National Gas Exhibition of 1913—and to ensure that they are made widely known.

All this, we are sure, might be improved, and in the interests of the gas industry we hope that it will be. But apart from the business aspect emphasized above we do hope that the gas industry, which has its roots so firmly fixed and is part of our national life, will come to be more closely identified with the illuminating engineering movement, which needs the help of everyone. We are not unmindful of the great services which Mr. Goodenough, one of the Vice-Presidents of the Illuminating Engineering Society, has rendered to illuminating engineering as well as to the cause of education generally; nor of the generous aid of Mr. Watson and others; nor of the encouraging support of Mr. Terrace, who, we are glad to learn, is now associating himself directly with the Illuminating Engineering Society. But there is room for the efforts of many others. We believe that it would add to the prestige of the gas industry to be more prominently associated with this good work, and that it is a field where the sagacity and knowledge of human nature, with which many of its leading men are gifted, would prove exceedingly valuable.

\* "The Lighting Load," by "Gaslight," May 18th, p. 513.





## Illuminating Engineering Society

### REVISED ARTICLES AND BY-LAWS.

Readers will find on p. 161 an account of the annual meeting of the Illuminating Engineering Society on June 4th, which terminated a most successful session. When the next session opens in October the Presidential chair will be occupied by Dr. J. W. T. Walsh, and readers will join us in wishing him and the Society equal prosperity during his term of office. Meantime attention may be drawn to the Special General Meeting which is to take place at the House of the Royal Society of Arts (18, John Street, Adelphi) at 6.30 p.m., for the purpose of considering the revised Constitution, which has been cast into the form of Articles and By-laws, as a basis for incorporation. Whilst this meeting has inevitably been arranged at a somewhat unseasonable time we hope that all members will make a special effort to attend. The step proposed is a very important one for the future of the Society. If the Articles and By-laws are accepted in substance at the coming meeting there is a good prospect that the process of incorporation may be completed during the next session.

### Light and Lighting

In his introductory address, at the annual meeting of the Illuminating Engineering Society, the President gave an admirable survey of the inter-related activities of various bodies in this country interested in illumination. He also emphasized especially the importance of international co-operation—a point which had been dealt with in the discussion of Mr. Wilson's paper at the preceding meeting (see pp. 167-173). The attention of readers may be directed to the address on "Light and Lighting" delivered by Mr. Paterson at the 22nd Annual Convention of the American Illuminating Engineering Society last year, which now appears in the *Transactions*. The first portion of the address dealt with early efforts at illumination. (It is interesting to observe that oil lamps of beautiful design dating to nearly 4,000 B.C. have been found during the recent excavations at Ur.) Mr. Paterson entered into a brief discussion of recent theories of light, and concluded by a survey of some of its chief applications. He made a special plea for the collection of statistical data illustrating the beneficial effects of good lighting—a field in which much remains to be done. Truly the achievement of the past 20 years in connection with applications of light have been remarkable. It is encouraging to look back occasionally and to see how far we have travelled. We must, however, beware of the snare of complacency. We are apt to congratulate ourselves that, whereas our predecessors thought in terms of "light," we are concerned mainly with "illumination." Yet, as Mr. Paterson put it, we should avoid giving our successors reason to say of our generation: "Illumination had they, but no insight; much light but little vision."

### Lighting Calculations

We notice in *The Illustrated Carpenter and Builder* a series of articles by Mr. P. W. Peel dealing with industrial lighting, in the course of which the essentials of good lighting are explained and simple lighting calculations illustrated. The more widely disseminated such information the better, and we congratulate our contemporary on its enterprise. Methods of making calculations

and planning the lighting of interiors are somewhat difficult to deal with succinctly. Procedure has been standardized by leading firms in the lighting industry, but the application of the charts and tables provided naturally implies the use of certain types of units. There are also in practice many cases—notably when aesthetic considerations prevail—where methods based on the subdivision of the area into squares, each furnished with a similar lighting unit, cannot be applied. It is therefore a great advantage to be able to calculate illumination approximately from first principles. In the field of decorative and architectural lighting, where luminous panels, friezes, etc., are used, such calculations may become complex and difficult. Fortunately exactitude in predetermining illumination is not always requisite. Predeterminations may frequently be helped out by preliminary experiments on a small scale, but the result ultimately depends largely on the experience and instinct of the designer. In such cases, in fact, lighting becomes less of a science and more of an art, though such fundamental principles as avoidance of glare must still be observed.

### The Lighting Value of Paint

Our recent comment on the above subject has led to our being favoured by a letter from Mr. Luckiesh, who assures us that the impression that polished surfaces reflect more light and are easier to keep clean than matt ones is incorrect. The matter is of some importance in the smoky atmospheres of such cities as London. Materials with a more or less glazed surface are now being favoured for exteriors of buildings. Such surfaces probably do retain their light tint better than bricks and stone, and are easier to clean by steam. But one imagines that this is largely because the unprotected brick or stone rapidly becomes corroded and engrained with dirt. The same, no doubt, applies to certain forms of glass. In the case of interiors, however—to which Mr. Luckiesh's comment is no doubt intended to apply—the superiority of a polished surface, even in this respect, is less certain. So far as reflection of light *per se* is concerned, lighting experts would naturally prefer a matt surface which should reflect as well as a polished one and diffuse the light better, at the same time enabling the troublesome formation of images of light-sources to be avoided. One finds in the case of schools and offices a disposition to specify polished surfaces in the belief that they are more easily kept clean. If it could be shown that the matt surfaces were not at a disadvantage lighting experts could recommend them with confidence. The point is also of interest in connection with the design of lighting fittings. When we are dealing with transmitted light a polished exterior surface is usually no drawback. In the case of the internally frosted lamp the benefit of the smooth outer surface has been strongly emphasized by lamp makers and it appears to be difficult to devise any form of external treatment which answers equally well. But there are many cases where a diffusing reflecting surface is desired for a reflector, but some doubt is felt as to how it would wear. In one particular case—the illumination of boardings, time-tables and large vertical surfaces generally—the use of a matt surface is of outstanding importance. Direct reflections from enamelled surfaces and the like are a constant source of trouble. We should like to see a detailed investigation made into the whole question, preferably in a smoky city atmosphere and extending over at least six months.



### Absorption of Light by Opal Glass

Whilst, as was well illustrated in Dr. English's two papers before the Illuminating Engineering Society, steady progress in the preparation of glassware for illuminating purposes is being made, there are certain problems that have not yet been satisfactorily solved. One of these is the production of really efficient opal glass. The diffusing qualities of this variety of glass render it extremely useful, but the absorption is still higher than it should be. When hemispheres and bowls of opal glass are used the loss in light is not usually of great moment, but when the source is completely enclosed it is apt to be disconcertingly high. Some interesting researches in this field by Gehloff and Thomas\* are summarized in the journal of the Society of Glass Technology. Opal bulbs of 80 mm. diameter gave absorptions of from 14 to 15 per cent. The investigations of the authors lead to the belief that if absorption were due only to the increased light-path it should not be more than about 4 per cent. Clear glass, after being decolorized in the ordinary way, has a distinct grey tint and an absorption (in thicknesses similar to those of lamp bulbs) of about 2 per cent. This grey colour is also present in opal glass, and owing to multiple reflections from the opalizing particles the absorption is accentuated. Complete removal of iron oxide from an opal glass reduces the absorption to 10-11 per cent., but it would seem that the most serious absorption takes place in the opalizing particles themselves and not in the containing medium. Possibly a solution may be found by decreasing the number of particles on the lines suggested by Ryde and Yates.

### Architectural Lighting in a Theatre

An interesting example of architectural lighting in the Theatre Saint-Georges, Paris, is described by M. Siclis in *La Revue de l'Eclairage*. Lighting is effected almost entirely by concealed units. A feature in the auditorium is the use of a three-deck ceiling, with cornice lighting by series of coloured lamps, which enables diffused illumination of any desired hue to be obtained. The aim in this lighting scheme has been to establish a transition from ordinary lighting conditions to the fanciful illumination in the theatre itself. Accordingly the lighting of the entrance hall and corridors is done with white light, though by unusual methods, whereas in the auditorium colour combinations are given full play. The same applies to the general scheme of decoration.

### Coloured Luminous Steam

The search for novelties in advertisement lighting continues unceasingly. Luminous signs are familiar. In the United States it is even complained that air-mail beacons are now so numerous that a searchlight swinging across the sky has lost its power to attract. The latest device, described by Messrs. L. C. Porter, G. F. Prideaux and W. H. Steiger in the *General Electric Review* (U.S.A.) is the illuminated steam beacon. In the experiments described a stack 120 feet high was fed with live steam, and a cloud formed at the summit was illuminated by a battery of 30 500-watt floodlights, equipped with colour screens. The effect was quite striking, especially with red light, and the cost is stated to compare favourably with that of an ordinary flood-lighting installation.

\* *Zeitschr. f. tech. Physik*, 1929, 9, p. 173.

### The Lighting of Airways and Airports

In a recent paper before the American Institute of Electrical Engineers, Mr. H. E. Mahan pointed out the enormous growth in air-lighting in the United States. To-day there are over 15,000 miles of airway in operation and 1,330 established airports, exclusive of army and navy fields. By the middle of the present year it is expected that upwards of 11,000 miles of airway will be lighted. In marking out these routes beacons play a more important part than in this country, where distances are relatively short. The standard beacon consists of a 1,000-watt 115-volt gasfilled lamp in a revolving 24-inch searchlight. Quite a comprehensive technique as regards lights to mark boundaries and obstructions, to illuminate hangars and landing areas, etc., has developed. Boundary lights are now green and obstructions are marked by red lights. Flood-lighting is extensively utilized to reveal landing places and hangars, and it is specified that the illumination on the latter must attain 2.5 foot-candles. Light has other incidental uses, e.g., beams directed upwards can be used to estimate the height of banks of clouds. Just as highway authorities are finding it expedient to mark road boundaries and obstacles by the aid of white paint, airport engineers are aiming at making use of light materials for landing areas and finish important objects in white paint so as to render them more readily visible by night.

### Confessions of a Dichromat

An amusing article in *Light* records the experiences of a confessed dichromat. His partial colour-blindness does not seem to have involved serious inconvenience, though unfortunate attempts to match ribbons in a general store led to the discovery of the defect. This dichromat can extract plenty of pleasure from a sunrise. The degree of colour-blindness depends on the part of the retina used. At a distance crimson ramblers are lost in their foliage; at closer range the bloom is red and the leaves are "green"—though the writer in his mind habitually describes a distant green lawn as "red." Purple and blue are not separate colours. It is interesting to note that the writer, notwithstanding his disability, is quite well able to distinguish traffic signals. The green is a sort of bluish grey, the yellow a flame-colour midway between the red and green. It is even more interesting to hear that the early traffic signals could not be so well distinguished, apparently either because the colours were not sufficiently pure or because the intensities were too low.

### Lighting Developments in India

From a report furnished by a Special Correspondent of *Electrical Industries* it appears that trade in lamps and lighting appliances in India is making steady progress, though one may conjecture that far greater business should be possible in the future. In the year 1927-28 the United Kingdom furnished upwards of £10,000,000 in electric lighting accessories and fittings. Germany comes next with about 2½ million. In Madras, progress appears to be encouraging. Supply of current began in 1907 and there are now 363 installations, including 12 towns. There is evidence of increasing public interest. On the other hand the recent unrest in Bombay has been prejudicial. According to *Municipal Engineering* the public lighting engineer in that city has been having an arduous time owing to the damage caused to public lamps by rioters.



## TECHNICAL SECTION

COMPRISING

Transactions of The Illuminating Engineering Society and Special Articles

*The Illuminating Engineering Society is not, as a body, responsible for the opinions expressed by individual authors or speakers.*

### Annual Meeting of the Illuminating Engineering Society

*(Proceedings at the Annual Meeting of the Illuminating Engineering Society, held at the House of the Royal Society of Arts, 18, John Street, Adelphi, London, W.C., at 6.30 p.m. on Tuesday, June 4th, 1929.)*

THE annual meeting of the Illuminating Engineering Society was held at the House of the Royal Society of Arts (18, John Street, Adelphi, London, W.C.) at 6.30 p.m., on Tuesday, June 4th, THE PRESIDENT (Mr. Clifford C. Paterson) presiding.

The Minutes of the last meeting having been taken as read, the Hon. Secretary announced the name of the following applicant for membership:—

Head, O. W.....Assistant Lighting Engineer, Great Western Railway, 3, Bernard Avenue, West Ealing, London, W.3.

The names of applicants presented at the last meeting\* were read again and these gentlemen were formally declared members of the Society.

The Hon. Secretary also announced that Mr. S. L. Pearce, Chief Engineer of the London Power Co. Ltd., who had been a member of the Society prior to the war, had rejoined. He felt sure that all members would be gratified to hear that the Society would have the help of Mr. Pearce, and he hoped that others prominently associated with the electric supply industry would also be induced to share in the good work that it was doing.

THE PRESIDENT then explained that the business before the meeting was the consideration of the Annual Report of the Council and the Accounts for the past year, but before presenting these for discussion he had been asked to make a few remarks dwelling on some aspects of the work of the Society.

#### PRESIDENTIAL ADDRESS.

A cause such as Illuminating Engineering, or in other words "good lighting," he remarked, if it is to be strong and progressive, must have the effective support of all those influences in a country which count. Learning, without the ability to disseminate it widely, is of little use. Knowledge of the art without the power to apply that knowledge in everyday practical engineering is like the talent buried in the ground.

Illuminating engineering is exceptional in having to achieve a very wide co-ordination of existing forces before it can regard itself as effectively marshalled for the battle of progress. Firstly, there are the two main methods of lighting, by gas and electricity. Secondly, light is an everyday household and business commodity and therefore the knowledge of it cannot be confined to experts. The man in the street must be helped to understand it. Research is essential in order to clear up its many obscure areas; standardization is needed to keep pace with practical development. Manufacturing and public utility interests are very deeply interested in making and supplying for public use products which conform to the best modern standards of equipment.

Now these activities of education, propaganda,

research, standardization and engineering application should not be divorced from one another. The cause of good lighting cannot move forward effectively if each organization or each man feels that he has one of those spheres and one only. The real method of co-ordination in our human affairs is through the people who are engaged in them—by the men who count in each sphere having an effective share and substantial interest in the others.

"I wonder," the President proceeded, "if it is realized how well founded is the cause of illumination in Great Britain in these respects. Look for a moment at the way in which we are organized. On the one hand we have the British National Illumination Committee resting equally on the three main institutions of gas, electric and illuminating engineers, supported by a series of other influential bodies and government departments. This same National Committee is also the Sectional Committee of the British Engineering Standards Association and represents the cause of illumination internationally. On the other hand for personal intercourse, for exchange of experience and dissemination of information and for all those purposes for which a society can exist, we have the Illuminating Engineering Society, the personnel of whose Council is in no small measure interchangeable with that of the National Committee. In the third place we have the Illumination Research Committee of the Department of Scientific and Industrial Research and the National Physical Laboratory working in close collaboration, not merely together but with the bodies I have mentioned. Finally this machinery is strongly supported by the influential manufacturing and development concerns, both gas and electric.

"My chief hope is that in their own as well as our interests the public utility undertakings, both gas and electric, are going to respond keenly to an invitation to fill the gap which somehow has occurred in our structure owing (with one or two notable exceptions) to their virtual absence hitherto from energetic co-operation in the illumination movement. (I know that this is not deliberate. It is, as they might say in the United States, just a 'happenstance'.)

"The real cement which binds together all this organization, I firmly believe, is the unanimous desire of everyone to act together for the good of the cause we have at heart, realizing as we often do in this country that, if our industry as a whole progresses, benefit will come to every section of it—academic, research, consulting, manufacturing, commercial, and, above all, the great general public of which we all form a part.

"I do not think there is any country in the world where the conditions are more propitious or where more real progress has been achieved in illumination matters. It has given me the greatest satisfaction to have been honoured by being the President of this Society during a year when, owing to the excellent series of meetings, the

\* The Illuminating Engineer, June, 1929, page 135.



acquisition of so many substantial sustaining members, and the establishment of a very sound financial position, the Society has so greatly strengthened itself for usefulness. I hasten to disclaim any personal responsibility for these advances, but I am grateful for the opportunity of having been allowed to serve those who are.

"The task which I have set myself before I leave office is, in conjunction with my colleague (your Hon. Secretary) and the special committee, to lay before you for your consideration a constitution of the Society which shall be fit to serve as a basis of its incorporation. This step, I feel, is long overdue, and I sincerely hope I may have your support in settling this matter once and for all, so that next session, under the Presidency of Dr. Walsh, it may come before you for final acceptance, cleared of debatable matter and clothed with all those embellishments with which the lawyers are wont to adorn the plain language of engineers. The revised Articles and By-laws are now in draft.

"As you know, we have big preparations to make for 1931. The whole Council of this Society has combined with the British National Committee to form a General Council for the 1931 Illumination Congress. This will give us an opportunity nationally and internationally, such as this Society has never had before, to knit together all the influences in this country which can make for progress in good lighting. If we use our opportunities well I feel that by 1931 there is no reason why we should not have grown 50 per cent. in numbers and influence. If everyone tries we could do it."

In conclusion the President remarked that the Report of the Council had been circulated. For the moment he felt more disposed to say a word about the Council than about its report. This was the same Council which, under Mr. D. R. Wilson's guidance, kept the Society together after the loss it had sustained by Mr. Gaster's death and the policies which it initiated were now bearing fruit. No society could hope to be served by a more loyal body of men than that constituting the Council of the past two sessions. The report was now before members for consideration and comment.

#### ADOPTION OF ANNUAL REPORT AND ACCOUNTS FOR 1928.

Mr. A. W. BEUTTELL briefly commented on the great amount of spade work which had been done during the past session towards enlarging the scope of the work of the Society, and placing it upon a sound and firm foundation. He felt that the thanks of the members were due to officers and Council for their efforts, and that the Society was fortunate in having had as its President during the past year a brilliant scientist who had devoted himself to fostering its progress.

He desired to move the following Resolution:—

"That the Report of the Council for the session 1928-1929 and the accounts of the Illuminating Engineering Society for the period from January 1st, 1928, to December 31st, 1928, be hereby adopted, and that a vote of thanks be extended to the President, Council and Officers for their efforts on behalf of the Society during the past session."

The Resolution was briefly seconded by Mr. E. L. OUGHTON and on being put to the vote was carried with acclamation.

Mr. D. R. WILSON, after expressing his appreciation of the reception given to the efforts of the Council during the past session, said that he wished to emphasize the value of the work done by the officers and especially by the Hon. Secretary, Mr. J. S. Dow. Presidents came and went, Councils changed in constitution, and the progress of a Society of this nature depended very largely upon its secretary. Nobody who occupied the Presidential chair could have had a more loyal collaborator than Mr. Dow, or one who had the interests of the Society more at heart, and he would like to move a special vote of thanks to him for the work he had done.

The vote of thanks having been carried unanimously, Mr. J. S. Dow briefly expressed his appreciation of Mr. Wilson's kind remarks. The Society had been faced by new problems when Mr. Gaster passed away, and it

was indeed fortunate that it had had in the Presidential chair first Mr. Wilson and then Mr. Paterson, both of whom had devoted themselves ungrudgingly to the Society's welfare and had guided it into a stronger and more prosperous condition. He felt himself that during the past two years much had been done to improve the position and prestige of the Society and in this work all members of the Council had shared. He hoped and believed that at the next annual meeting they would again have an encouraging record of progress to present.

#### Some Further Applications of Synchronously Intermittent Light for Revealing Moving Machinery

The PRESIDENT then called upon Dr. J. F. Crowley to deliver his address on the above subject, which was illustrated by numerous interesting experiments. In introducing his subject Dr. CROWLEY recalled the use of instantaneous photography to obtain an image of a body in rapid motion. Thus Dr. Boyes had obtained photographs of bullets taken by the light of an electric spark. If the motion is very rapid direct photographic registration may be impracticable, but even in such cases photographs may be obtained if the motion is periodic or recurrent so that the plate may be exposed at successive instants whilst the body is passing through the same space interval in the same direction.

Another possibility arises from the fact that the image received by the eye, like that on a sensitized plate, is retained for a certain time after the image has been removed or cut off from view. On this phenomenon of "persistence of vision" are based the numerous stroboscopic methods which permit glimpses of the moving body at periodic intervals. The first practical instrument of this type was the stroboscope introduced by Plateau, of Ghent (1801-1883). The idea has subsequently been elaborated in many ingenious instruments such as the Drysdale strobometer and the Ashdown and Whidbourne stroboscopes, which were exhibited in operation.

Dr. Crowley then passed on to a description of other instruments such as the stroborama depending on the illumination of the moving apparatus by neon lamps. By adjusting the frequency of the electric circuit the intermittent light can be brought into synchronism with the moving machine which appears to stand still. Very striking experiments were performed with a sewing machine in motion and a rapidly driven propeller, and the lecturer referred to numerous applications of these methods in industries where one is concerned with intricate fast-moving machinery.

The PRESIDENT, in moving a cordial vote of thanks to Dr. F. Crowley for his extremely interesting paper and fascinating demonstrations, said that it would no doubt be a revelation to some of those present to hear of the valuable work that had been done in this field by Dr. Crowley and others. Certainly the advances seen that evening held great promise for the future, and by the aid of this apparatus it might be possible to solve many difficult problems and to find out many unexpected things. At this late hour he would not suggest any discussion, as it would probably be agreed that such time as was still available would be better employed in demonstrations. He asked members to express again to Dr. Crowley and Mr. Ashdown, Mr. Angus Harper, Mr. Elverson and others who had contributed to this extraordinary interesting evening. (Applause.)

Dr. CROWLEY briefly expressed his appreciation of the reception given to his address, and said that he would also like to add to the names mentioned by the President the following:—Messrs. Vlies and Benson (for MM. Sequin et Ostheimer), The New Oscilloscope Co. (Mr. Elverson and Mr. Wenning), Messrs. Tinsley & Co. and Messrs. A. J. Ashdown Ltd., whose apparatus, exceedingly interesting and valuable, did not lend itself readily to mass demonstration but could be studied by members of the audience individually. He also wished to thank Mr. Stevenson, of the British Research Association for the Woollen and Worsted Industries, and Mr. Judge. All these had helped in the loan of apparatus and in other ways.

## Report of the Council for the Session November, 1928, to June, 1929

(Presented at the Annual General Meeting of the Illuminating Engineering Society, held at the Royal Society of Arts (John Street, Adelphi, London, W.C.), at 6-30 p.m., on Tuesday, June 4th, 1929.)

IN presenting this record of the past session the Council is gratified to be able again to report further progress in the work of the Illuminating Engineering Society. Following the great loss sustained in the death of its Founder, Vice-President and Honorary Secretary, Mr. L. Gaster, in January, 1928, members of the Society have united in making every effort to place it on a firm foundation. In particular the Council desire to put on record their great appreciation of the services rendered by the President, Mr. Clifford C. Paterson, O.B.E., who has presided at all meetings, and has devoted much time and effort to the Society's affairs.

### ELECTION OF OFFICERS AND COUNCIL FOR THE NEXT SESSION.

It will be recalled that the procedure to be adopted in connection with the election of officers and members of the Council was outlined at a Special General Meeting held on February 19th. The procedure approved at this meeting has been adopted. A list of all the existing officers and members of Council and of all nominations made by the Council to fill vacancies was published in *The Illuminating Engineer*, and also circulated to all members of the Society, who were afforded an opportunity of making additional nominations, if they so desired.

No independent nominations having been received, the gentlemen nominated by the Council are automatically elected. Accordingly Dr. J. W. T. Walsh will become President for the next session; Mr. F. W. Goodenough, C.B.E., and Lieut.-Commander Haydn T. Harrison will become Vice-Presidents. Mr. J. S. Dow and Mr. J. Wyatt Ife will continue as Honorary Secretary and Honorary Treasurer respectively.

The following members of the Society will fill the vacancies on the Council:—

Mr. A. W. Beuttell, Mr. G. Campbell, Mr. P. Good, Mr. J. Macintyre, Mr. E. L. Oughton, Lieut.-Colonel W. A. Vignoles, D.S.O., and Mr. H. T. Young.

### MEETINGS OF THE SOCIETY.

The papers and discussions during the past session have again been of a varied character.

The opening meeting, on November 6th, was, as usual, devoted to a review of progress in illuminating engineering. The usual report on progress during the vacation was presented by the Honorary Secretary, an address dealing with the International Illumination Congress in the United States was delivered by the President, and the report of the progress in electric lighting was presented by the committee formed for this purpose. In addition there was a comprehensive exhibit of novel lamps, lighting appliances and instruments.

At a subsequent meeting, on December 11th, Mr. H. Lingard read a paper entitled "The Application of Electric Lamps to Advertising." This paper was illustrated by numerous lantern slides and by a representative display of different types of illuminated signs. An important feature of the paper was a series of recommendations on the design and dimensions of signs to secure a maximum visibility, a subject on which little information has hitherto been available.

On January 22nd Dr. L. C. Martin, D.Sc., A.R.C.S., read a paper on "Colour and its Applications," which was supplemented by a series of experiments illustrating the phenomena of colour mixture and colour harmony, etc. On February 19th the practice, successfully adopted in former sessions, of devoting an evening to the discussion of various problems in illuminating engineering was followed. Novel lighting installations at the New Piccadilly Underground Station (Mr. S. G. Elliot), the Horticultural Hall, Westminster (Mr. L. M. Tye), the new Carreras Factory (Mr. G. Herbert), Davis' Kinema Theatre at Croydon (Mr. Basil Davis), and the Majestic Theatre and Kinema at Wembley (Mr. R. A.

Ives) were described. Some notes on the lighting of the covered tennis courts at Queen's Club were contributed by Mr. G. F. Allom.

On March 19th a somewhat novel subject was introduced by Mr. Waldo Maitland in his paper on "Architectural Lighting." The paper was illustrated by numerous lantern slides showing striking installations at home and abroad, and at the conclusion of the meeting members had an opportunity of inspecting the new Architectural Lighting rooms of the E.L.M.A. Lighting Service Bureau, where many of the devices described in the paper were shown in actual operation. On April 30th Dr. S. English, D.Sc., F.I.C., F.Inst.P., whose paper in the previous session had aroused much interest, gave a supplementary paper entitled "Some Further Properties of Glass and their Application in Illuminating Engineering," which gave rise to an excellent discussion. At the conclusion of this meeting, which was held in the Lecture Theatre of Messrs. Holophane Ltd., members were given a demonstration of novel applications of coloured light by Mr. R. Gillespie Williams. On May 14th Mr. G. H. Wilson delivered a paper reviewing the proceedings at the meetings of the International Commission on Illuminating and the International Congress held in the United States in 1928, which was heard with great interest, and will form the basis of a record of this important Congress in the *Journal of the Society*.

It is hoped that, following the conclusion of the formal business at the Annual General Meeting on June 4th, a paper will be read by Dr. J. F. Crowley dealing with "The Use of Synchronously Intermittent Light for Revealing Moving Machinery."

### SPECIAL PROVINCIAL MEETINGS.

For some time there has been a general feeling that something should be done to extend the scope of the Society's work, and that meetings should not be entirely confined to London. A step in this direction was taken during the past session. A series of special meetings was arranged in Birmingham (October 22nd), Manchester (October 29th), Newcastle (October 31st), and Glasgow (November 1st). At these meetings introductory addresses outlining the aims and objects of the Society were delivered respectively by Mr. D. R. Wilson, Mr. Justus Eck, Lt.-Colonel C. H. Silvester Evans and Mr. J. S. Dow. On each occasion Mr. J. L. H. Cooper delivered again the paper entitled "An Investigation of Electric Lighting in the Engineering Industry," which was read in London in the previous session. These meetings were uniformly successful and attracted excellent audiences. It is hoped that they will be followed by others of a similar nature, so that ultimately the Society may secure a nucleus of members in all the chief Provincial centres.

Shortly after the termination of these meetings Mr. Justus Eck opened a discussion on "Modern Illuminating Engineering" in Dublin on November 6th. On this occasion, also, some reference was made to the aims and objects of the Society. It is believed that in the Irish Free State, where important electrification schemes are now being developed, there are excellent opportunities for illuminating engineering.

### THE PUBLIC LIGHTING CONFERENCE AT SHEFFIELD.

The fifth Annual Conference of the Association of Public Lighting Engineers, held in Sheffield during July 9th-12th, was attended by a number of members of the Illuminating Engineering Society and by representatives of the B.E.S.A. Committee on Street Lighting. Several papers on various aspects of public lighting were read, but the item on the programme of outstanding interest was the series of 50 experimental street-lighting installations, covering approximately eight miles of streets, which had been arranged by Mr. J. F. Colquhoun (Public Lighting Engineer to the Sheffield Corporation).



These installations were intended to illustrate the practical working of the British Standard Specification for Street Lighting, and were closely studied by visitors. In addition to a general tour of inspection a series of tests was contrived to estimate the effects of glare and the relation between the lighting system and visibility, the tests being made by the aid of a series of special experimental discs. The results of these tests are now being studied by the Illumination Research Committee and by the B.E.S.A. Committee on Street Lighting, and no doubt some useful conclusions will be drawn.

#### REPORTS ON RESEARCHES.

Apart from the discussions at its own meetings the Society is interested in the investigations being conducted by numerous committees, on many of which members of the Illuminating Engineering Society are serving. In the recently issued annual report of the National Illumination Committee of Great Britain reference is made to investigations that are being conducted on such subjects as Factory, Office and School Lighting, Street Lighting, Photometry, Daylight Illumination, Glare, Cinema Lighting, etc. A considerable amount of work is also being done by various committees serving under the British Engineering Standards Association, which during the past year has issued Specifications dealing with Translucent Glassware (No. 324), Tungsten Filament Lamps (No. 161), and Photometric Integrators (No. 354).

Other researches undertaken by the Illumination Research Committee are mentioned in the annual report of the Department of Scientific and Industrial Research. Amongst the subjects investigated may be mentioned the enquiry into the lighting of compositors' rooms, the efforts to discover means of preventing pictures and museum specimens from fading under the influence of light, and the study of the permissible daylight factor in rooms devoted to office work. Other researches in progress include an enquiry into the conditions of illumination requisite for docks, and for such special purposes as work on jacquard looms, paper making and the finishing of silverware. The Illumination Research Committee is also occupied with research on the relation of glare and visibility in street lighting, for which purpose experiments are being made on a model street.

Reference may also be made to a report by Messrs. H. C. Weston and S. Adams, issued by the Industrial Fatigue Research Board. This report confirms the impression formed as a result of previous researches regarding the effect of eyestrain on the output of linkers in the hosiery industry. Eyestrain is shown to be of equal importance in such processes as the mounting of lamp filaments and various fine processes in the textile industry, and in these cases also the use of a suitable magnifying glass was found to lead to a substantial improvement in the efficiency of work. From the standpoint of the illuminating engineer the problem is of special importance. Cases arise in which the lighting is unjustly blamed when it is really the mechanism of vision that is at fault. In cases of fine work, therefore, it should be noted that not only should the illumination be adequate but that magnifying glasses may be necessary. Otherwise the eye may be unable to make effective use of the illumination provided. In this connection reference may be made to two of the series of "Health Leaflets" issued by the Joint Industrial Council of the Printing Trades. Leaflet No. 10, entitled "Good Lighting of Printing Offices," summarizes the chief conclusions reached by the Illumination Research Committee, in the enquiry mentioned above. Leaflet No. 11, which was prepared by Mr. W. G. Barker, Past President of the British Optical Association, presents some data illustrating the importance of attention to the eyesight of those engaged in the printing industry.

The report of H. M. Inspector of Factories for the year 1928 again contains gratifying evidence of a progressive improvement in industrial lighting. Special interest attaches to the investigations conducted by Miss Coombes in cotton and woollen mills, and Mr. Shopland in engineering and various special industries. The statistics furnished by both observers show that, whilst

lighting generally is improving, there are still many factories which fall below the standard recommended by the Home Office Departmental Committee on Lighting in Factories and Workshops.

#### THE INTERNATIONAL ILLUMINATION CONGRESS.

The outstanding event of last year in other countries was undoubtedly the International Illumination Congress, which took place in the United States during September, 1928. The proceedings may be divided into three sections. There was firstly a tour of inspection of a number of the leading cities in the United States, where many interesting things were seen (September 7th-17th). Secondly, the twenty-second Annual Convention of the American Illuminating Engineering Society took place in Toronto (September 17th-20th). Thirdly, the delegates proceeded with their tour to Saranac Inn, N.Y., where, during September 22nd-28th, the plenary session of the International Commission on Illumination took place.

This was probably the most representative gathering of lighting experts from different parts of the world that has yet taken place. There were in all about seventy delegates from countries other than the United States, amongst whom were included a number of members of the Illuminating Engineering Society. All delegates have spoken with enthusiasm of the generous hospitality they received and the keen interest in illumination shown at these meetings.

#### THE INTERNATIONAL ILLUMINATION CONGRESS, 1931.

An opportunity of repaying in some measure the hospitality enjoyed in America will be afforded in 1931, when the next session of the International Commission on Illumination will be held in this country. The preliminary steps towards the organization of this Congress, for which the National Illumination Committee of Great Britain and the Illuminating Engineering Society will assume joint responsibility, are already being made. The Council feel confident that all members will heartily approve of the decision that the Illuminating Engineering Society should share in the work of organizing this important Congress, and that they will individually do what is possible to render this gathering an outstanding success.

#### OTHER EVENTS ABROAD.

Ample evidence is forthcoming of the growth of interest in illuminating engineering in all the chief countries. The German Illuminating Engineering Society again organized a successful annual meeting, at which varied and interesting papers were read. Organizations interested in illumination have co-operated with local authorities in organizing "Festivals of Light," which have been held in many of the chief German cities. It is reported that in many cases the holding of a festival of light has led to a permanent improvement in the lighting conditions.

Another interesting event has been the exhibition entitled "Light in the Service of Mankind," which was held in Stockholm during September 1st to 23rd. A description of this exhibition, which included not only exhibits of ancient and modern lighting appliances but also demonstrations of good and bad methods of lighting, has recently appeared in the journal of the Society. It is believed to have had a valuable educational influence.

Earlier in the year illuminating engineering was made a feature at the Electrotechnical Conference held in Leningrad. A series of papers on photometry and illumination was read, and in the course of the proceedings a special resolution was passed recommending the encouragement of researches on illumination and the holding of a special conference where more numerous papers on various aspects of illumination might be read.

A third outstanding instance of enterprise in illuminating engineering abroad is to be found in the special lighting arrangements which are being made for the World Exhibition to be held in Barcelona this year. It is reported that the spectacular lighting on this occasion will be on an unprecedented scale.



Another illustration of the growing interest in illumination abroad is afforded by the fact that new journals devoted exclusively to this subject have recently been published in Paris, Brussels and Milan.

#### THE TWENTIETH ANNIVERSARY DINNER.

During the present year the Society attained its Twentieth Anniversary, and it was decided to commemorate this event by a dinner, which was held at the Trocadero Restaurant on February 13th. The dinner proved to be an enjoyable event, about 180 members and guests being present, which is approximately twice the number secured at any previous dinner held by the Society.

Members and their friends were welcomed by Mr. C. C. Paterson and Mrs. Paterson. After the usual loyal toast had been honoured, Mr. H. T. Tizard, C.B., F.R.S. (Secretary of the Department of Scientific and Industrial Research), proposed the toast of "The Illuminating Engineering Society," to which Mr. C. C. Paterson responded. The toast of "Our Guests" was proposed by Mr. D. R. Wilson (Past President), and Mr. John Terrace (President of the Institution of Gas Engineers) and Professor J. Teichmüller responded.

At the conclusion of the dinner the room was cleared for dancing. The remainder of the evening proved equally enjoyable. It was generally agreed that the plan of arranging short speeches followed by dancing had proved a success, and might well be considered on similar occasions in the future.

#### THE GASTER MEMORIAL FUND.

In the course of the dinner the President referred to the general desire to find an adequate method of preserving the memory of the Founder of the Illuminating Engineering Society. He announced that it is intended to establish a "Gaster Memorial Fund," the interest on which would be applied as an award for the best contribution submitted each year to the Society, the author of which would receive a Gaster premium. Full particulars of this proposal, which the Council is confident will meet with a sympathetic response from all members of the Society, will be announced at the opening meeting of the next session.

#### REVISED CONSTITUTION OF THE SOCIETY.

At the Special General Meeting of the Society, held on February 19th, it was explained that the special clauses then adopted, which were designed to regularize the procedure in regard to elections, would ultimately be included in Articles of Association and By-laws of the Society, when application was made for it to become an incorporated body. The framing of a complete series of Articles and By-laws has been receiving the attention of a committee, and the draft is now approaching completion. The Council hopes to be in a position to submit this draft to the members at a Special Meeting to be called before the opening meeting of the next session. After these clauses have been fully discussed, and any approved modifications made therein, the draft Articles and By-laws will then be submitted to legal experts, and the Board of Trade will be approached.

#### STATEMENT OF INCOME AND EXPENDITURE.

The statement of income and expenditure and the balance sheet for the year 1928 are included as an appendix to this report. Two members of the Council (Lieut.-Colonel C. H. Silvester Evans and Mr. A. Cunningham) have kindly undertaken the auditing of these accounts, which they found to be prepared in a satisfactory manner, and which reveal a gratifying improvement in the financial position of the Society. Attention may be drawn to the fact that at the end of the past financial year all expenditure incurred had been met, and after doing so the Society found itself with a surplus exceeding £200. It is hoped during the present year to consolidate the position still further, with a view to the greater expenditure which will inevitably be incurred in the future as a result of the continually extending work of the Society. It will be observed that the accounts for the past year include provision for a new item, the series of meetings arranged in provincial cities,

and it is hoped to make this a permanent feature of the work of the Society.

In anticipation of the procedure which will become necessary when the Society becomes an incorporated body, the Council propose that accounts for the current year should be audited by a Chartered Accountant.

#### INCREASE IN MEMBERSHIP.

During the past session progress in membership has been made. A gratifying response has been made to the proposal that leading firms in the lighting industry should become sustaining members of the Society. The number of sustaining members secured up to the present date is twenty-seven. It will be observed that they furnish approximately one-third of the total revenue of the Society during the year 1928. The Council, however, attach even more importance to the fact that the system of sustaining membership enables the Society to be linked with all the leading firms in the lighting industry, so that in future the sustaining members will furnish a valuable source of information on lamps and lighting appliances and their application, and will enable the Society to speak with some authority for the lighting industry as a whole. It is hoped that this list of sustaining members will, in course of time, be considerably extended, and especially by the inclusion of organizations of consumers and large users of light, so as to be fully representative of all those interested in illumination.

In addition, the Society has secured in the ordinary way forty-six members, of whom ten are "country members." It will be recalled that, following the series of special meetings in Birmingham, Manchester, Newcastle and Glasgow, the Council adopted the resolution whereby members residing more than 50 miles out of London will have the option of joining either (1) as full members paying the usual subscription of £2 2s. per annum, or (2) as country members, under the same conditions as those applying to associates (i.e., the payment of an annual subscription of £1 1s., the applicant having all the privileges of membership except those of voting or being eligible for office). It is hoped that this arrangement will prove to be of considerable utility in the future, when the Society is in a position to develop its work in provincial cities on a more extensive scale.

Whilst the steady flow of new members during the past year is satisfactory, the Council would like to point out that this increase still falls far short of what is desired if the Society is to assume the position which the importance of its work justified. Members are therefore asked to do their utmost to bring the Society to the notice of any friends likely to be interested in its work, which is of benefit alike to the lighting industry and the general public.

#### PROGRAMME FOR NEXT SESSION.

The programme for next session is now being studied by the Papers Committee, and promises to be as varied and interesting as in recent years. The Hon. Secretary would be pleased to hear from any members prepared to read papers and open discussions, and would welcome any suggestions in regard to future procedure, which will receive the careful consideration of the Council.

#### FUTURE DEVELOPMENTS.

Looking back over the past year, the Council feel that much has been done to put the Society on a stronger footing, and they look forward to still greater developments in the future. During the next session they will be specially concerned with the problem of increasing the membership of the Society and developing its work in new directions, and they hope to initiate various steps which will afford opportunities of useful work on the part of the younger members of the Society. In particular they will have before them the preparations for the International Illumination Congress of 1931, which should provide the Society with a unique opportunity of rendering valuable service to the cause of better lighting, and making its aims and objects more widely known.

CLIFFORD C. PATERSON, *President*.  
J. S. DOW, *Hon. Secretary*.



## A Review of the Proceedings of the 7th Session of the International Commission on Illumination and the International Illumination Congress in the United States in 1928

By G. H. WILSON, B.Sc., A.M.I.E.E.

(Paper presented at the Meeting of the Illuminating Engineering Society held at the Home Office Industrial Museum, Horseferry Road, London, S.W. 1, at 6-45 p.m. on Tuesday, May 14th, 1929.)

THE subject of illumination has not long passed through its adolescent stage and the present years are years of considerable activity and rapid development.

If progress is to be made on the soundest lines, one of the most effective methods of ensuring this is by the co-operation of workers in the field of illumination, not only in our own country but also abroad. The International Commission on Illumination has set up machinery which enables contact to be obtained in this way and provides a means for the establishment of standards and the interchange of information, with discussions upon current problems.

The 7th plenary session of the Commission was held by invitation at Saranac Inn, N.Y., U.S.A., in September, 1928, under the presidency of Mr. C. C. Paterson, and by the addition of a tour of American Cities and attendance at the Convention of the American Illuminating Engineering Society, at Toronto, the sphere of usefulness of the meetings was considerably widened. The enlarged conference was christened by our American hosts the "First International Illumination Congress."

Twelve nations were represented altogether, and it is of interest that two of them, Brazil and Sweden, were present for the first time. Austria, France, Germany, Great Britain, Holland, Japan, Sweden, Switzerland and the United States provided delegations and Russia representatives, and the success of the meetings was in no small measure due to the interest and enthusiasm of the various groups.

The British group included the President and Mrs. Paterson, Dr. J. W. T. Walsh (the General Secretary of the I.C.I.), and the following, who comprised the delegation: Major J. W. Buckley (Metropolitan Vickers Electrical Co., Ltd.), Mr. W. E. Bush (E.L.M.A.), Mr. J. F. Colquhoun (Sheffield Corporation), Mr. P. Good (Institution of Electrical Engineers; deputy leader), Dr. W. M. Hampton (Messrs. Chance Bros.), Mr. J. M. Henshaw (British Thomson-Houston Co., Ltd.), Mr. L. B. W. Jolley (G.E.C. Research Laboratories), Prof. J. T. MacGregor Morris (Institution of Electrical Engineers), Mr. J. W. Ryde (G.E.C. Research Laboratories), Major G. H. Spittle (Railway Clearing House), Mr. E. J. Stewart (Glasgow Corporation), Mr. C. W. Sully,

(E.L.M.A.), Mr. J. R. Thomas (Edison Swan Electrical Co. Ltd.), Mr. J. M. Waldram (John Waldram & Son), Mr. R. Watson (Institution of Gas Engineers, leader of the British Delegation), and Mr. G. H. Wilson (G.E.C. Research Laboratories). Mrs. Good and Mrs. Jolley were also of the party, and Mr. A. Goddard and Mr. T. C. Keeley attended as members of the Congress.

The sea trip from Southampton to New York gave time for recreation and for the final organization of the British Delegation. Mr. Good, acting as leader in Mr. Watson's absence, probably curtailed many delegates' social programmes by dividing the party up into groups responsible for various subjects, whose members met, often many times a day, to decide on their course of action at Saranac. These meetings may have appeared a little irksome at the time, but the results at the technical sessions proved their value without a doubt.

### THE TOUR.

On the day following the landing at New York, the delegates registered at the temporary New York Headquarters and then began a tour of the city.

By special arrangement the transporting motor coaches received the same consideration as do fire engines in this country, and much ground was covered during the three days' stay.

In the ten days which followed, Boston, Philadelphia, Washington, Cleveland, Detroit, Chicago and Niagara were visited, and it will be appreciated that such a period did not give time for an exhaustive study of lighting conditions, and any conclusions drawn should not be taken as the results of a thorough investigation.

North America is a vast continent and comprehensive though the tour was, only Eastern and Middle West cities were visited, the study of conditions in the West being left to those more fortunate delegates who were able to cross the continent.

*Interior Lighting.*—The subject which is of paramount importance to every person, be he the illuminating engineer or not, is interior lighting. There was evidence in every American city visited of a whole-hearted co-operation between illuminating engineers, lamp and fittings makers and supply companies to engender in



FIG. 1. A gathering of Delegates to the International Illumination Congress outside the Bureau of Standards.



the public a realization of the benefits of good lighting. The lighting load is not considered undesirable on account of its influence on load factor, and when once adopted, as with advantage it might be by supply authorities in all localities, this principle provides a good groundwork on which the illuminating engineer can build. There was little opportunity for visiting private houses during the tour, but the lighting of numerous public buildings was studied in some detail. In the majority of new buildings the lighting is considered as an integral part of the construction and not as a subject divorced from architecture. A notable example is the Philadelphia Museum of Art, in which artificial daylight is so skilfully installed that it is not easily apparent that natural daylight is not the lighting agent. The installation was described at Toronto (I.E.S. Vol. XXIV, p. 61), but an actual study of it was necessary to reveal the excellence of the result.

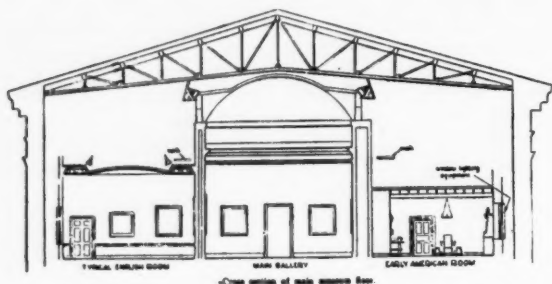


FIG. 2. Sectional view of the Philadelphia Museum of Art.

In addition to the advantage of constancy of illumination the scheme enables the Museum to widen its sphere of usefulness by being open at times convenient for visitors who are at work during the day. It might be thought that expense would prohibit the general adoption of such schemes, but it was learned that the cost at the Philadelphia Museum was only 4 per cent. of the total building cost.

Another class of building in which new methods of design are being employed is the Bank. Mr. J. L. Stair stated at Toronto that the "jail and fortress" type of bank is fast disappearing in America and present designs incorporate lighting fittings which harmonize with the surroundings and bring out the architectural beauty of the interior. The proper quality and quantity of illumination have also to be provided, and the schemes for lighting the grilles and counters show as much originality as the layout of the general lighting. The latest development is the use of the show window for attracting clients to the bank, and excellent results are said to have been obtained by this means.

**Street Lighting.**—The demands for development in all branches of illuminating engineering are becoming more and more insistent, and in public lighting this is particularly true. For many years American cities have progressed with "white way" street lighting, treating this as having artistic and advertising value as well as being utilitarian. Numerous installations were seen where rippled glass decorative units are fitted on posts approximately 100 ft. apart with double side spacing. Cleveland, reacting probably to the influence of N.E.L.A. Park, had a number of such installations employing lamps from 10,000 to 25,000 lumens rating (approx. 500 watts to 1,200 watts) mounted at 15, 18 or 21 ft. above the street level. These mountings are lower than those common in equivalent streets in this country, and it was the opinion at least of some of the visitors that the lighting would have been improved if the lamps had been higher and if the units had been more directive in character. Refractors are sometimes used within the outer globes, but frequently the bare lamp light is not controlled at all.

The most ambitious and yet one of the most dignified of installations was visited at Detroit. Washington Boulevard is lighted by five 1,000-watt lamps on each of

twenty-eight decorative standards, which in common with the majority of the posts seen on the tour had been beautifully designed. Decorative glassware, of which many excellent patterns were seen, enclosed the lamps and the resultant illumination was very high. The installation and running costs must be heavy, for the consumption is 92.6 watts per linear foot of street as compared with 15.6 watts per foot in an experimental Class B street at Sheffield. But apparently it is possible to obtain the support of business houses in the vicinity, and thus the burden is somewhat relieved from the local taxation, at all events in the early stages of the installation.

The smaller side streets, except in special cases, have not received the attention they are usually given in this country. Beacon lighting is rightly criticized, but some light is often better than none at all, and the widely spaced but regular installations in many of our side streets appear preferable to the rather spasmodically lit or unlit street of many towns in the Eastern States. Units are available for such locations, however, and at the Lynn Works of the General Electric Co. a new simplified line of pendant fitting was demonstrated. A standardized set of lantern tops, bodies, over reflectors, refractors and globes can be assembled to form units of various types. The refractor is popular in these sizes, and a diversity of forms is available.



FIG. 3. A view of one of the Standards in the Washington Boulevard, Detroit, yielding 105,000 lumens per pole.

The magnetic arc lamp, although gradually being replaced by gasfilled lamps, is still widely used, and the characteristic whiteness of the light emitted appears strange when first observed, for this type of lamp never seems to have been introduced into England.

**Illuminated Signals for Traffic Control.**—The lighting of streets has been a problem in all countries for many years, but lighting for traffic control is relatively new. Traffic density in American cities necessitated action before it has been required in England, but the problem is undoubtedly with us now and we can save the time usually lost in gaining experience, by a study of the systems in America. Automatic colour light signals have largely replaced the point-duty policeman, and they appear to work admirably. Two or three systems are available, but the progressive system whereby the traffic is enabled to pass down a street at a uniform speed and to cross all intersections without check is undoubtedly the most satisfactory.

The timing devices connected to the signal systems, which were examined at Lynn, synchronize the various signals so that one signal clears at a definite time after



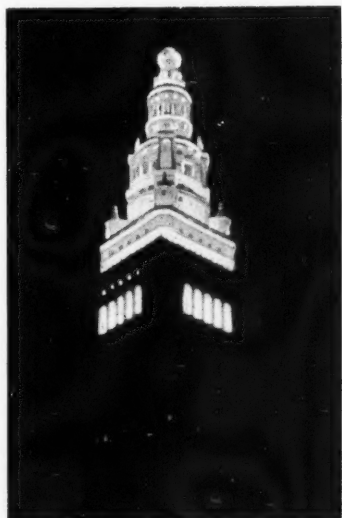
FIG. 4. Night view from the top of the Union Terminal Tower, Cleveland.

the one before it. The period is a function of the distance between crossings and the desired traffic speed, for example, 25 m.p.h., and vehicles move in groups which arrive at signals during the "GO" period. The rectangular block of course lends itself to such schemes, and the bird's-eye view which we had from the top of the Union Terminal Tower in Cleveland (the second highest office building in the world) provided an ideal demonstration of the efficiency with which the system can operate.

Complicated street intersections introduce the difficulties of right and left turns, etc., but with care the system is probably applicable even to the difficult situations in British towns. There is some danger, with the increasing number of street posts, traffic signs and now colour signals, of an approach to the forest of poles at one time so common in the U.S., but which is now fortunately disappearing. There is no need for signals to be unattractive in appearance, however, and in many cases arrangements can be made for their attachment to existing posts.

**Outdoor Advertising and Floodlighting.**—The increasing number of outdoor advertisements is probably also regarded by many with apprehension, but they seem bound to come and their commercial value is probably doubled if they are visible at night. The illuminated poster was therefore in evidence in all the cities visited. Three 200-watt lamps in enamelled reflectors appear adequately to illuminate a 16-sheet poster, but the secret lies in the distance of the fittings from the advertisement, which is usually 8 to 10 ft. The reflectors are carried on steel tubing projecting from the top of the poster, and the effect with posters of real artistic merit is excellent.

Floodlighting may in some cases come under the heading of advertisement, though installations like that on the Capitol at Washington certainly do not. Many good examples were seen, notably the Terminal Tower, Cleveland, and the Edison Building, Detroit. Picked out against the dark sky the top of a skyscraper is a spectacle if adequate illumination is provided. It is probable that the values we have been accustomed to in this country are low in comparison, for an illumination of 20 foot-candles appears to be required even on light-coloured buildings for an outstanding result to be achieved. On the Terminal Tower 56 200-watt, 116 500-watt and 68 1,000-watt projectors are used to produce this illumination, and the energy consumption is 4 watts/square foot.



(By the courtesy of "The Electrician.")  
FIG. 5. Floodlighting of the New Terminal Tower, Cleveland.

Niagara Falls are floodlighted at night as a general practice, but on the occasion of the Congress visit the full battery of 24 searchlights was in operation. Colour effects were introduced and, as a special feature, a giant optical projector, comprising a searchlight and 12-in. objective lens, projected an image of the "Maid of the

Mist" on to the Falls. The rapids in the gorge were also floodlighted, and in this case the artificial lighting undoubtedly emphasized the play of the water over the rocky river bed.



(By the courtesy of "The Electrician.")  
FIG. 6. Special demonstrations of Floodlighting were given at Niagara Falls. This picture shows the final searchlight fan.

**Shop-Window Lighting.**—The shop-window lighting movement in Britain is rapidly catching up to American standards, but the average level of illumination is not yet as high. The units in the United States are usually well concealed, and the addition of high intensity spotlights to the installations enables items in artistically dressed windows to be singled out, although the general level of illumination is already high.

**Supply Stations and Laboratories.**—In concluding this brief account of the tour, reference must be made to the numerous works, supply stations, lighting institutes and laboratories visited. In particular one would remember N.E.L.A. Park with its 90 acres of grounds and laboratories equipped for research in physics and lighting, and the development of new types of incandescent lamps and lighting appliances. In addition, there are demonstration rooms for instructional work of all kinds, similar to those at the Edison Institute, Harrison, N.J. The Bureau of Standards was visited, but our stay was of short duration. So also was the visit to the Electrical Testing Laboratories in New York, but the time was sufficient to appreciate the earnestness with which illumination measurements are made, and the accurate and rapid methods which have been developed for lamp photometry and measurements on lighting appliances of all kinds.

#### THE ILLUMINATING ENGINEERING SOCIETY'S CONVENTION, TORONTO.

The ten days' tour was followed by attendance at the I.E.S. Convention held at Toronto, which, in forming the second part of the Congress, also formed an excellent technical summary of much that had been seen previously. During the seven days' stay, papers were read on various illuminating engineering subjects as is customary at the Convention, but on this occasion the discussions were international in character and many papers were in fact presented by foreign delegates. The majority if not all of these have been or are being reprinted in the *Transactions* of the Illuminating Engineering Society, and time will not permit of a chronological account of the proceedings. Where, however, a paper had a direct bearing on the work of the Commission, reference will be made later at the appropriate point.

#### THE SEVENTH PLENARY SESSION OF THE INTERNATIONAL COMMISSION ON ILLUMINATION.

In addition to its technical and educational value, the Congress formed a most useful adjunct to the Commission meetings, as by the 24th September



delegates were thoroughly accustomed to the consideration and criticism of illumination problems. The place chosen for the seventh session, Saranac Inn, in the Adirondack Mountains, was ideal from the points of view of facilities for meetings and its geographical position, and the delightful surroundings provided opportunities for healthful relaxation for those who were fortunate enough to find time to enjoy them.



FIG. 7. Lake Placid, near Saranac.

The first plenary session opened with an address of welcome by Dr. J. W. Lieb, Chairman of the Reception Committee, and this was followed by a short address by the President, who reviewed the work of the Commission since the last meeting of Technical Committees at Bellagio in 1927, and mentioned the scheme initiated at that time for appointing National Committees, instead of the Central Bureau, as the Secretariat for the study of given subjects. Later developments were to prove the success of the arrangement.

**Street Lighting.**—At the close of the session the first series of technical papers was presented. The subject was Street Lighting and a list of the various contributions has already been published in the journal.\*

Mr. Paterson, in his paper on the British Standard Specification for Street Lighting, reviewed and discussed the four principal clauses of the specification, i.e., classification, post height, spacing-height ratio and illumination under service conditions and urged the advantage of a simple though incomplete specification as a beginning. In addition, the importance of regarding the classification as a rating and not as a figure of merit was stressed. This paper was followed by Mr. L. Schneider's contribution on the "Physiological Basis of Street Lighting," in which vision in a street is traced back to five "sensitivities" of the eye, and a method of appraisal of street lighting by the speed of braking of an automobile in certain circumstances is suggested.

The American Committee submitted two papers representing their views on general considerations of street lighting and giving data on typical installations, and the Japanese Committee contributed a similar report.

Although the papers were discussed, most of the time of the Committee was spent on discussing the German Secretariat report, and two additional meetings were found necessary to complete the work. There was considerable controversy on the criteria for the effectiveness of street lighting, the British Committee adhering to the view that the value of minimum illumination gave a simple classification. Many committees, however, felt that the value of average illumination more truly indicated the illumination result, but the difficulty of ascertaining the figures had to be admitted. Mr. Gouffé presented a paper describing an apparatus for calculating average illumination, and this merits careful consideration.

One or two American delegates were firmly of the opinion that no illumination measurements would give any representation of the excellence of the street lighting and that as some light was necessary on houses or other buildings the street should be considered as having three surfaces. In view of this it was recommended that

the lumen output of the lamps per linear foot of street be taken as a classification. The suggestion generally did not meet with approval.

Quite as controversial a point was the plane of measurement, Germany and Austria advocating one metre height on account of the simplicity of working, and Great Britain and other countries the value of measurements at ground level. Finally agreement was reached and a number of resolutions were framed, of which the following are the more important and are therefore given in outline.

"That in order to facilitate international comparisons of street-lighting installations there are adopted as essential characteristics:—

1. The average horizontal street illumination in the carriage way;
2. The minimum horizontal illumination in the carriage way;

the plane of reference for both being the surface of the street; and that the Secretariat Committee should study whether it is possible to adopt a general agreed plane of measurement of street illumination, together with the adoption of a suitable type of portable photometer."

Committees were requested also to collect data on existing installations and to consider suggestions for tests for glare and visibility, two of the most difficult problems in illumination work.

**Traffic Control by Illuminated Signals.**—Mr. Halvorsen's paper on "Traffic Signals" was read at the Street Lighting session and, following on what had been observed throughout the tour, was of extreme interest. The paper formed an excellent summary of current practice in America and the subject was felt to be one of great importance, in which the interchange of information between countries would be valuable and international agreement possibly desirable. Recommendations were, therefore, made that a Secretariat Country be appointed, and Great Britain has now taken on the task.

**Aerial Navigation.**—A second new subject, which is becoming of ever increasing importance, was the lighting for Aerial Navigation. In this the American Committee had taken the initiative of submitting a questionnaire to the National Committees, and the replies showed the various systems and types of equipment in use. As time goes on international agreement on airway lighting will be as important as it is on the sea, and the United States Committee, who have agreed to act as Secretariat for this subject, will probably find it one that develops rapidly.

**Signal Glasses.**—Coloured Signal Glasses came under discussion in the normal way, for Committees have now been considering this subject for some time. It takes on an added importance, however, now that traffic signalling and aerial navigation are to be considered by the Commission. A considerable measure of agreement was reached in this subject, and three useful papers were presented. The British Secretariat report touched upon the types of colour standards employed by various countries, and the methods of their preparation and use; and the Japanese Committee presented a similar report describing their own standards. In Great Britain standard light and dark limit glasses are kept by the Board of Trade for checking the colour of ships' navigation lights, and spectrophotometric curves, total transmission and colorimetric data have now been obtained for these glasses, assuming their use with a source of colour temperature 2,000° K. The Ministry of Transport and the Air Ministry have similar standards for railway work and night flying, and in America, Germany and Japan the position is similar to that in England, but where transmission curves were given they indicated differences between the requirements in the various countries. Drs. W. Dziobek and M. Pirani presented a paper on the "Standardization of Signal Glasses" and suggested a method of defining a colour by its position in the Young-Helmholtz colour triangle, as well as by measurements on hue and saturation. Mr. Guild's paper dealt with the selection of a

\* *Illum. Eng.* Vol. XXI, pp. 312—3.

suitable yellow signal in order that its colour might not be confused with white or red lights. Efforts were made at all times to reduce discussions to concrete proposals which would make for progress, and this effort was successful at the Technical session on Signal Glasses.

It was resolved that the following items are pertinent to the definition of a Signal Light:—

(1) That the assembly giving rise to the Signal Light consists essentially of two elements, viz., a light source and a light filter.

(2) That the light source is most suitably defined in terms of colour temperature from which its spectral distribution of energy may be readily derived.

(3) That the filter is most suitably defined in terms of its spectral transmission.

(4) That the resultant effect, viz., the light flux, is most suitably defined in terms of its trilinear coordinates on the basis of the Young-Helmholtz theory, it being understood that agreement upon the exact values of the three excitations and their corresponding luminosity coefficients is still held in abeyance.

(5) That unless there be specific reason to the contrary, it is recommended that for general purposes data relating to the resultant light flux be computed on the assumption of a source at the colour temperature of 2,360°K.

(6) The Committee recommends that until better values are approved by the I.C.I. the excitations (sensation curves) as given in the Colorimetry Report of the Optical Society of America, published in the *Journal of the Optical Society*, Vol. VI, p. 549, 1922, be used.

(7) For the purpose of comparing the transmission of the filter for any given source, it is recommended that the data of visibility of energy, as adopted by the I.C.I. at Geneva (*Astro. Jour.* 48, p. 65, 1918, and C.I.E. *Proc.* 6, p. 67, 1924) be used.

**Automobile Headlights.**—One further phase of the traffic-lighting problem with which the Commission is dealing is the Automobile Headlight. The menace of glare is too well known to require description, but if the driver is to have adequate illumination from his own headlights it is not simple to prevent them from becoming glaring to approaching drivers. In some countries, and in particular in certain American states, there is already legislation on the permissible light distribution from headlights, but generally there is none, and as the technique of reflector manufacture is developing and the number of automobiles increasing at a great rate, it is desirable that a satisfactory solution should be rapidly found by a thorough interchange of information. The American Secretariat's report summarized the situation in various countries, and M. P. Bossu made definite recommendations in his paper for a standard performance of headlights which would comply with the rules of the "Commission des Projecteurs d'Automobiles." His proposal was that only the results should be standardized and not the means for obtaining them, and that two beams should be available, one for fast driving on clear roads, and an alternative for use when passing other vehicles, the beam intensities conforming to definite standards. Views were too divergent for agreement on such a question, but it was felt by all that the elimination of focussing devices, by which any attempt at standardization could be upset by the individual driver, was a necessity, and this point was agreed. Mr. L. B. W. Jolley's paper was of value in this connection, for his application of the divergence data for parabolic reflectors, submitted by Mr. J. W. Ryde and Miss D. Yates, demonstrated the practicability of the elimination of focussing and enabled suggestions to be made for reflector and lamp types which rendered the effects of manufacturing tolerances a minimum.

It is now the duty of National Committees to continue with the collection of data, and as a first step the paper by Dickinson & Allen, presented at Toronto,\* is well worthy of study. In that paper the lighting requirements from the driver's point of view have been investigated by a method which defines the regions in which it

is necessary to project the light to cover moving objects at certain distances.

**Factory and School Lighting.**—In the lighting of of factories and schools it is now fully realized that improvement in the general welfare of the personnel is as important a function of the illumination as the effect on production or vision. Too much data cannot be collected on the effect of illumination on vision, however, and the paper by M. Cohu at the Factory and School Lighting session added to our knowledge of the subject. The investigation was concerned with the effect of light on production, but, as a first experiment only, the effect on "reaction time" was investigated. A curve summarized the relation between the time taken to record the existence of a change in an object and the illumination upon it, and indicated a rapid reduction in "reaction time" with increasing illumination up to 28 lux, and thereafter a small but continuous reduction up to 140 lux, after which no data were given.

The Swiss Committee's "Rules for Illumination" which were presented were extremely simple in form, giving only the advantages of good lighting, a few recommended illumination figures, and notes on such points as lamp efficiency, effect of dirt, etc. The Japanese recommendations for school lighting, however, dealt with all phases of the subject in great detail and the paper is well worthy of study.

The most important decisions at this meeting, however, were in connection with the Geneva Code. This code of recommended illuminations was the product of the last plenary meeting of the I.C.I., but all the committees reported that it was little used, largely on account of the values of minimum illumination which were given and which were lower than modern standards. It was, therefore, unanimously agreed that the code should be brought up to date with recommended as well as minimum illumination values, and that its name should be changed from the rather meaningless title of the "Geneva Code" to "The I.C.I. Code." The publication of the new code will be awaited with interest.

**Kinema Lighting.**—Kinema lighting is in some measure associated with Industrial Lighting, and the terms of reference of this committee were that it should endeavour to determine the essential conditions involved in providing suitable screen brightness with a minimum of glare and distortion. The Japanese Committee were acting as Secretariat and presented a report on a large amount of investigatory work carried out in Japan. The values of screen illumination recommended for adoption, however, were generally considerably below present-day standards, and the recommendation of the meeting was that a questionnaire should be circulated to the National Committees asking for information on present practice in regard to screen and general illumination and the layout of the kinema.

**Daylight Illumination.**—Natural lighting is a subject of paramount importance, although possibly rather unattractive to many illuminating engineers as it does not lend itself readily to control and calculation. Four papers were presented at Saranac in addition to the Secretariat report, and dealt with the connection between daylight and public health (P. J. Waldram), practical architectural design (J. G. West), the protection of pictures and museum specimens from fading (J. A. MacIntyre and H. Buckley), and the distribution of energy in daylight (H. H. Kimball). In modern building construction daylight lighting is an important factor, and the possible effects of insufficient daylight are serious enough to warrant care in design and possibly legislation to prevent over-commercialization affecting public health by the undue concentration of buildings.

In connection with the deleterious effect of daylight, Messrs. MacIntyre and Buckley have found that although light of all wavelengths is responsible for the fading of pigments, the violet and ultra-violet regions are the most active. In their paper the results of investigations on various systems of coloured glasses are given and a suggestion is made that a quinine compound, opaque to radiation below 0.39 $\mu$  is likely to be useful as a filter on glass or incorporated in a varnish.

\* *Trans. I.E.S.* XXIV, p. 15.



Prior to this meeting there was little agreement on the method of expressing daylight measurements and a resolution put forward by the British Committee was, after some amendment, agreed in the following form:—

"That the value of daylight illumination at any point in an interior shall be expressed either by the horizontal illumination prevailing when the exterior illumination due to the unobstructed hemisphere of sky is 5,000 lux or by the roof ratio, which is the ratio between the two values mentioned above."

**Diffusing Materials.**—It is peculiar that one of the commonest materials used by the illuminating engineer—Diffusing Glassware—is proving to be one of the most difficult to test in a useful manner and to specify. Investigations have been carried out to study the relation between the physical and optical properties of diffusing media, and Dr. Pirani described some of these in his paper. Mr. J. M. Waldram and Dr. W. Dziobek, on the other hand, described practical methods of measurement. The German report differentiated between matt, opal, ornamental and matt-opal glasses and proposed certain definitions for regular, diffuse and total transmission and reflection factors as applied to diffusing materials. These were agreed after slight modification and were submitted to the Definitions Committee. In view of the incomplete knowledge of the variables in the problem, it was not possible to progress as far as a specification based on any simple method of measurement.

**Classification of Lighting Fittings.**—Difficulty often arises in the comparison of the lighting equipment supplied by various manufactures, and it would be very desirable if a common classification could be used by all manufacturers based upon the performance and characteristics of the equipment. This would also facilitate international understanding if a common method could be agreed upon. The Light Flux Committee has had the work in hand, and MM. M. J. Wetzel, H. Desarces, and D. Demeure had some definite proposals for a classification based upon the spacing-height ratio at which fittings must be used to obtain a uniform illumination. The British Committee made a suggestion that some method might be evolved depending on the solid angle into which the majority of the flux was concentrated, but the subject obviously warranted further consideration by the National Committees before any decisions were taken. As it was known that certain terms—for example, direct, indirect, intensive, extensive, etc.—were in use in various countries, it was agreed to circulate a questionnaire in an endeavour to see if any international agreement could be reached on such terms while alternative methods of classification were being investigated.

The title of the Committee was altered by agreement to that given above, as it appeared more closely to describe the actual programme of work in hand.

**Glare.**—Glare is a most important factor in vision, but its investigation involves great difficulties. In Mr. Stiles' paper, which was presented at the "Glare" session, the author states that the results of work by various investigators on the effect of glare on brightness difference threshold are not in agreement, and that further work is required to determine the reason. The number of investigators in this field has been small, but an increase is noticeable and we may look to the future in anticipation of some useful results appearing. The collection of researches submitted by Mr. Preston Millar and Mr. S. McGray forms a useful summary of the work performed up to the present time. A classification of the effects of glare which was suggested in the paper was combined with definitions submitted by the British Committee and sent to the Secretariat Committee for consideration.

**Photometry and Standards.**—It has happened that in the arrangement of this account the subjects with which the Commission began its work have been left until the end. It should not be assumed that their importance is any the less on this account. The international unit of intensity is still obtainable only from certain incandescent filament lamps in the custody of the National Laboratories of France, Great Britain and the United States, and endeavours are therefore being

made to develop a reproducible standard of intensity. Two papers were presented at Saranac by Herren C. Müller and R. Frisch, the first describing progress on the Warburg standard and the second discussing the prospects of establishing a simplified unit by means of an absolute measurement of total radiation. Although the problem is not yet solved, much useful work has been done and the thanks of the Commission were officially accorded to the French and German investigators.

The status of candle-power standards was recorded by S. C. Crittenden and J. Franklin Meyer in their paper, which introduced the subject of colour differences in photometry. Measurements under these conditions are liable to considerable inaccuracy, and a method for the elimination of empirical features was foreshadowed at Bellagio. Work has been in progress in this connection, and it was stated in a resolution that: "the Commission recommend its active prosecution by a method based upon the calculation of relative luminosities, using spectro-photometric data and the visibility factors accepted by the I.C.I. at Geneva in 1924, and it expresses the hope that this work may speedily result in the establishment of a standard method for heterochromatic comparisons suitable for adoption by the I.C.I."

Pending the adoption of this method it appears necessary to adopt the values now used by the National Laboratories of the ratios of the Hefner standard to the International standard."

Standards	Colour Temperature	Ratios to 1%
Carbon filament lamp ...	2,000° K. ...	1.11
Tungsten filament vacuum lamp ...	2,360° K. ...	1.145
Gasfilled lamp ...	2,600° K. ...	1.17

The British Committee submitted a report on "Photometric Accuracy in Measurements on Electric Lamps," which, it was decided, should be included in the Proceedings of the Commission.

**Other Subjects.**—The above review probably includes all that is most interesting to the majority of members of this Society. But it would not be right to omit all reference to Heterochromatic Photometry and Colorimetry in which considerable progress was made and to the Vocabulary and Definitions and Symbols Committees which always perform their valuable functions. Lighting education, residence and shop-window lighting were also considered at the technical sessions, and useful summaries of existing conditions were given. Photometric test plates were discussed and at a general session papers on such subjects as "International Organization" by Mr. P. Good, "The Application of Rational



(By the courtesy of "The Electrician.")  
FIG. 8. Dr. J. W. T. Walsh, Honorary Secretary of the International Commission on Illumination.

Design Principles to Decorative Lighting" by J. Wetzel, and "The Application of Radiation of Various Wavelengths to the Study of Paintings in Museums and Collections" by F. Cellerier.

**Conclusion.**—At the final plenary session the resolutions of the various Committees were approved, and to the delight of the British delegation Mr. Paterson was re-elected as President, and Dr. Walsh was elected Honorary Secretary. In his remarks the President referred to the success of the session, which had achieved more than the most optimistic had hoped, and paid tribute to the excellent work of the Bureau and American Organizing Staffs which had made possible the completion of so large a programme.



(By courtesy of "The Electrical Review.")  
 FIG. 9. Delegates at Saranac, after the conclusion of the final Plenary Session.—Left to right: Mr. R. Watson (leader of British Delegation), Miss A. Wiggins, Mr. C. C. Paterson (President of the Commission).

Invitations were received from the Belgian and British National Committees to hold the next meeting in their respective countries and after some discussion the British invitation was accepted, the date being fixed for 1931.

Without having been at Saranac it is not possible to realize the keenness and enthusiasm which was shown at all times by the Bureau Staff and Delegates. There are only two years remaining before the eighth plenary session, and the full co-operation of individuals and interested technical bodies will be required if the rate of progress recorded in 1928 is to be maintained.

### Discussion

Dr. J. W. T. WALSH, opening the discussion, said that he had read the paper with very great interest. He considered that the Society was very much indebted to Mr. Wilson for his interesting description of what had taken place at the meetings at Saranac. It was most important that members should have an account of that kind. Those members who went to America and were in the atmosphere of the work that was being done in the field of international agreement and in promoting interchange of views on matters of illumination could fully realize the usefulness of the visit. It was a very different thing for those who were thousands of miles away from the meetings; only by means of such a paper as that presented by Dr. Wilson could they properly appreciate what had been done and how well worth while it was. He hoped that in the future when similar proceedings took place all would have an opportunity of being in the thick of them.

Members who had been to Saranac looked forward with pleasurable anticipation to the visit to England in 1931 of the International Commission and the holding of the International Illumination Congress. The ball had been set rolling and it was going forward with ever-increasing acceleration. He felt confident that the forthcoming Congress would be the biggest of the sort ever held and would be a real milestone in the progress of illumination. He trusted that all who took part in it would come away feeling that a tremendous stride had been taken. But such a result could only be reached by hard work during the intervening two years in preparation. The Society had already expressed its

willingness and eagerness to assist in the organization. The part that the Society played in the Congress would be very largely conditioned by the enthusiasm of its members. Two years was not a very long time in which to do what was necessary. They hoped to welcome a large number of delegates from the United States and from Europe and probably visitors from overseas. There were various duties to be discharged in connection with visitors. First of all they should be shown what was taking place in this country with regard to illumination. Next there should be ample opportunities for the exchange of ideas. It should be their aim to ensure that visitors would feel that every minute of time had been well spent.

He also wished to congratulate the members of the British delegation who attended the sessions at Saranac. He knew from his own observation and from remarks that had been made to him by delegates from other countries that the team work of the British delegates had made a great impression and had contributed very largely indeed to the success of the Congress. He was sure that it would bear more fruit because it was taken to heart as an object lesson by many of the other delegates, who would see that in 1931 they acted on the same lines.

Mr. Wilson had given an admirable bird's-eye view of the proceedings in America, and he had seen no other account of them that equalled it in interest. He congratulated him and the Society most heartily on the paper.

Mr. R. WATSON, a member of the British delegation, also heartily congratulated the author on his excellent summary. Having, like Dr. Walsh, read several accounts of the proceedings he envied Mr. Wilson's facility in description. In a short way he had given his impressions of the trip, of the gathering at Toronto and of the conference at Saranac. He (Mr. Watson) had had the privilege of attending several meetings of the I.C.I. and he noted with interest and gratification the progress made by the Commission. Previously subjects of scientific and academic interest had been brought forward, but the trend of the papers and discussions at the 1928 Congress was towards the practical application of knowledge with a view to giving the public what it required. Particular attention had been paid to the questions of the adequacy of the illumination and physical comfort attending its use. In addition consideration had been given to efforts to satisfy the aesthetic sense and that fact specially appealed to illuminating engineers.

He wished to add his testimony to the wonderful work of the British delegation in Saranac as a result of the sound preparations made by his friend Mr. Good. The whole week was a strenuous one. In addition, there were committee meetings in the evenings. Useful and practical work was done under the presidency of Mr. Paterson who, they were delighted to find, had been re-elected President of the Commission.

He was pleased to say that the American delegates had entertained them excellently. No pains were spared to render the visit enjoyable.

He was personally pleased that the Society was taking its share in the preparations for the 1931 Congress and would take part in the proceedings. The help that it could give to the International Illumination Committee would be greatly welcomed and of great service. He thought that the Congress would prove to be an advance on what had been done previously and would show that in all subjects connected with illumination England could take its part.

Mr. P. GOOD stated that as he was not very technically-minded and as he had not been sent on a technical mission he had been able to look at the trip from the outside. Even the initial period on board ship had been a busy as well as a most enjoyable one. He was glad that the importance of putting their backs into the preparations for the forthcoming Congress had been emphasized by Dr. Walsh. He could assure members that Dr. Walsh himself was setting a good example in this respect.

Mr. Wilson had referred to street lighting being



arranged for by contributions from owners of property. The plan appeared to be adopted in America of buying on the basis of "pay as you ride," as it was expressed in that country. Having goods and paying for them afterwards had at first struck him as unsound, but he was not quite sure that the procedure was as unsound as he had thought it. It might be a case of having goods in return for a promise to do more work and that, he considered, was why America was making great strides, as in that way a snowball was formed. A person with a lighting installation to sell would say to people with shops or stores, "We will put in this installation if you will pay us so much a year for 20 years." In that way big orders were secured and those who gave the orders had not to pay a large sum immediately.

As to traffic control by illuminated signals, it was extraordinarily interesting to drive down a street and watch the signals change just as one arrived. The signalling in Cleveland was so remarkable that vehicles could proceed at 20 miles an hour. He considered that it was a system which should be developed in this country.

He had been struck by the illuminated posters and particularly with the necessity of posters with an appropriate finish. Some had glossy surfaces and, viewed from some positions, lost their value. He thought that the question should be investigated. He would presently show some photographs illustrating floodlighting in some streets in America. The possibility of 20 foot-candles over most of our buildings should certainly interest those who supplied gas and electricity. It made one feel that there was ample room for bigger power stations and larger gasworks.

Mr. J. M. WALDRAM said that the paper was of special interest to him. He had been fortunate enough to be with Mr. Wilson during practically the whole of the time in America and he would like to congratulate him on his summary of experiences there.

The argument was often brought forward that traffic signals were all very well in America as in most of the cities there were straight streets crossing at right angles. It might interest members to know that Mr. Wilson and he went to Lynn in a car and saw one of the best systems of progressive traffic signalling that they had seen in America. Lynn and Boston were said to be places where Americans got lost and Englishmen found their way because there were no straight streets. It was necessary to see a fairly complete range of signals over a large area to get an idea of the advantages of traffic signals. All that some signals did was to stop one at inconvenient moments. Where there were not a sufficient number of signals for motorists to get used to them confusion resulted. The systems in use in various towns were not uniform, but he believed that attempts were being made to correct that.

In regard to street lighting in America, he thought that occasionally promise had outrun performance. When they set themselves out to make a beautiful street lighting installation much money was spent and frequently something better than anything that he had seen in this country was produced; and yet he thought that watt for watt they did not get quite as good a general effect as we did. When saying this he realized that it was most difficult to compare from memory an installation thousands of miles away with an installation on the spot. With regard to posts and glassware there were some very fine examples in America. These were definitely ahead in their decorative character but not from the point of view of illuminating efficiency.

Mr. Wilson had mentioned show-window lighting. In Chicago he (the speaker) had seen a show window in which the glass was absolutely invisible and there was no trouble with reflection. The floor of the window was rather narrow and the glass was curved. Lighting was effected by means of special trough fitting and the arrangement was such that one could see perfectly everything that was shown in the window.

In utilizing daylight the view taken in the United States seemed to be somewhat different from ours. When someone wanted more daylight he built above

his neighbours. In this country we endeavoured to obtain the same result by keeping the height of neighbouring buildings down.

Mr. J. S. Dow said that the problem of presenting an adequate survey of the vast amount of information on illumination, which was continually increasing, was one of which he was acutely conscious. The very considerable number of papers read at the International Illumination Congress was a case in point. It was impossible to deal with all of them, yet he had felt that some form of survey should be included in the proceedings of the Society for the present session. Fortunately Mr. Wilson had come to the rescue. Mr. Wilson's experience in the United States had been a special qualification for the task, and he was sure everyone would agree that he had discharged it in a very able manner.

The paper had naturally led previous speakers to comment on the Congress of 1931. Useful preliminary work was already being done. He was sure that every member of the Illuminating Engineering Society would wish to share personally in the task of making the Congress an outstanding success. The selection of subjects and the preparation of an orderly programme of papers would need care. Naturally the Congress and the session of the International Illumination Commission on Illumination would be primarily concerned with the interchange of views on technical problems and the promotion of standardization.

But there was another function of the Congress which he would like to especially emphasize—the great opportunity it afforded of bringing home to all sections of the community the importance of good lighting should not be lost. He therefore hoped that a fair proportion of the papers and discussions would deal with points which would kindle the public imagination and that the essential facts would be extricated from their context and presented to the public in an easily grasped form. International congresses furnished an admirable means of stimulating investigations and collecting information. But this was only part of the task; it was at least equally important that this information, when obtained, should be widely disseminated and should become generally known.

The PRESIDENT, proposing a cordial vote of thanks to Mr. Wilson, said that the question of international meetings and congresses was of absorbing interest. He had come to realize their importance more and more. There was a time when he used to think that congresses were at best a necessary evil and at worst an absolute nuisance. He now thought very differently, though he could still sympathize with those who thought as he once did.

In order to be able to appreciate the real value of congresses of the kind one needed to take an active part in them. They had many aspects of usefulness. The first of these was the discussion of technical subjects. Such discussion was the real and tangible reason for holding congresses and commissions of an international character. It should be realized that we had suffered and were still suffering from the failure of previous generations to appreciate the fact that the world was one whole, and that if things were to be done economically and well there must be a certain amount of standardization and uniformity of an international character. Many people were only beginning to realize the importance of national standardization, to say nothing of international standardization, not only in regard to literature and technical terms, but in many other ways. A certain amount of uniformity was required, but unless steps were taken at an early stage there was the greatest difficulty in securing good results. The example of the centimetre and the inch would always be present.

The existing state of things was due partly to people wanting to be different from one another. Whether or not that arose from national conceit he could not say. What was needed was a way of looking at things and thinking of things and dealing with them in such a manner that the worst was eliminated and the best appeared on the surface. During the last 10 years there had been a gradual trend towards uniformity and standardization.

Next he would like to emphasize the great advantages of personal intercourse. If we did not mix with people who were facing the same problems that we were facing and if we did not know what other countries were doing, we only saw the little corner of the picture that happened to be in our own country. Reading about what was going on and seeing illustrations was nothing like as instructive as seeing and hearing people in other countries. An international consciousness was wanted. We ought not to feel that we were free to do exactly as we wished in our own country regardless of the necessity for standardization and uniformity where they were really desirable. We must think not only of our own generation but of future generations and try to save them from having to meet together to attempt to overcome divergences.

Great things would be expected of the Society in 1931 and he hoped that they would rise to the occasion. The Congress was not merely intended to enable us to show other countries what we could do, nor even only to help us to make progress in technical standardization, though that was certainly one of the objectives. We had to endeavour to produce a "light-consciousness" throughout the people of this country, and the Congress should be organized so that as many of the general public as possible would hear about it and be made to think about the subject of illumination. That was one reason why it would not be confined to one place but would take the form of a tour and a series of meetings in different places. Sessions would be held in different centres in England and Scotland, probably ending up at Cambridge. Let them not be afraid to use the Congress for the purposes of publicity and propaganda in the best sense of the words, looking at the subject of illumination from an international point of view and not merely from the point of view of national and individual interests.

Mr. Wilson had made an apparently somewhat very dry subject intensely interesting, and he would ask the meeting to express its appreciation of the way in which he had presented his instructive survey.

Mr. G. H. WILSON, in reply, said: "I am grateful for the appreciative remarks which have been made in the discussion of my paper. It will have been well worth while if it stimulates only a little interest of the work of the International Commission on Illumination and aids in some measure the development of the valuable international understanding to which our President has made reference. During the writing of the paper I have constantly been reminded of how much interesting and valuable information it was possible to accumulate during both the Congress and the meetings of the Commission, and how little of it has been included in this account. Although so inadequate I hope it may indicate something of the potentialities of the 1931 meeting and the dependence of its success upon the enthusiasm with which its organization is undertaken."

## Tests of Glare and Visibility at Sheffield

Readers of this journal will recall the interesting series of tests on glare and visibility conducted in connection with the Conference of the Association of Public Lighting Engineers in Sheffield last September, in which many visitors participated. The results obtained have since been examined and a memorandum reviewing the results of the tests and suggesting some conclusions has been prepared by Mr. W. S. Stiles, who spent much time and trouble in organizing the experiments.

We have been invited to publish this summary in *The Illuminating Engineer* and we hope to be able to make a commencement in our next issue. The appearance of this report should be opportune in view of the forthcoming Conference of the Association of Public Lighting Engineers in Bournemouth next September.

## Street Lighting in Sheffield

In an address to the Sheffield Rotary Club on June 17th, Mr. J. F. Colquhoun, Lighting Engineer to the Sheffield Corporation, referred to a number of recent improvements in street lighting. He pointed out that the lighting of Sheffield now costs slightly more than a halfpenny per week per head of the population (i.e., less than 2s. 6d. per annum as compared with 4s. 5d. per head per annum in Leeds and 3s. 6d. in Manchester). This, it will be admitted, is a very moderate call on the citizens of Sheffield in return for the public lighting which they receive.

Mr. Colquhoun mentioned that there were 36,090 gas mantles on duty each night in 14,744 gas lamps. The small inverted mantles now used have an average life of 150 days, as compared with 28 days of the upright mantles formerly employed; they also gave, on an average, 1,460 burning hours. With hand lighting a man could deal with about 120 gas lamps, but with the aid of clock controllers he could manage 200 lamps or more. The automatic control, Mr. Colquhoun explained, had considerable advantages with also some drawbacks. It was cheaper than hand control, and the lamps were lighted more simultaneously. On the other hand it took no account of varying climatic conditions. He recalled that in 1925 he suggested that someday street lighting might be controlled by wireless. At the time this must have seemed a somewhat visionary suggestion, but, at the exhibition held in connection with the recent I.E.M.A. Convention, he had actually seen this method applied. In conclusion he emphasized the important influence of the surface of buildings and of the roadway in street lighting. He remarked that Sheffield was a particularly difficult place to light because of its dark buildings.

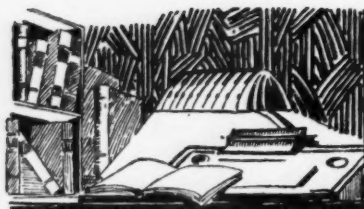
We observe that *The Sheffield Daily Telegraph*, in which an account of Mr. Colquhoun's address appears, prides itself on the unusually light character of its own new building, which is faced with white and washable material. We would commend to the notice of our contemporary the possibility of having this light exterior floodlighted—which would add still more to the brightness of Sheffield by night!

## Britain's Highway Costs

Under the above title *Municipal Engineering* draws attention to the remarkable progress recently made in road construction in this country, as revealed in Sir Henry Maybury's James Forrest Lecture before the Institution of Civil Engineers. The total mileage of roads in Great Britain is 17,914, and no less than 53 per cent. of that total received grants from the Road Fund. After allowing for the alteration in value of the pound sterling there is a striking contrast between the £18,000,000 spent upon the highways in 1913-14 and the £60,000,000 disbursed in 1928. In ten years the nation has expended £518,000,000 in this work, and road transport is still in process of development.

This may serve as an example of the manner in which vast amounts are now being expended in new directions. It encourages us to hope that ultimately the lighting of the new arterial roads, on which the flow of motor traffic is continually increasing, will receive more attention. In order to justify the large sums spent on their construction these roads ought to be extensively used by night, thus serving to relieve the general congestion by day. In order to encourage night traffic, they should, therefore, be effectively lighted, and as such roads are not used by local residents, but by through traffic engaged in journeys to distant places, a portion of the Road Fund might well be expended on their illumination.





## REVIEWS OF BOOKS AND PUBLICATIONS RECEIVED

THE EMPIRE MUNICIPAL DIRECTORY AND YEAR-BOOK, 1929-30.  
(The Sanitary Publishing Co. Ltd., London; pp. 324;  
12s. 6d. net.)

The 47th issue of this publication, which receives the distinction of a foreword by Sir Henry Maybury, is again a most useful production. As the title implies, the main portion of the volume (Section I), is devoted to a list of local authorities in the United Kingdom and the Overseas Dominions. This is remarkably complete. But the volume also contains a comprehensive survey of subjects covered by the wide title "municipal engineering." In Sections II to XIII, such questions as lighting, heating and ventilation, road making, motor transport, water supply, housing and town planning, fire prevention, and public recreation grounds are dealt with. Not the least useful are the two final sections, which include a list of scientific and public health societies of interest to municipal engineers and, under the heading "Where to Buy," a directory to municipal and sanitary trades. The directory, in fact, holds a unique position and contains a variety of information which is not available elsewhere. The review of lighting developments during 1928 (pp. 223-225) contains an account of the Conference of the Association of Public Lighting Engineers at Sheffield. This, rather curiously, contains no reference to the British Standard Specification for Street Lighting, which the representative exhibit of lighting appliances in the streets of Sheffield was intended to illustrate. We observe that the author regards the explosions in the Holborn area and the failures of certain lighting systems as being one of the chief factors in arousing interest in public lighting during the year!

WHITTAKER'S ELECTRICAL ENGINEER'S POCKET BOOK, Edited  
by R. E. Neale. (Sir Isaac Pitman & Sons Ltd., London,  
1929; pp. 775, figs. 356; 10s. 6d. net.)

The sixth edition of this well-known pocket book, originally founded by Lieut-Col. Kenelm Edgcombe, contains over 700 pages of closely printed matter and must be considered a bargain at the price at which it is offered. The general assembly of this vast amount of matter reflects great credit on the editor, Mr. R. E. Neale. The present edition has been rewritten by specialists and 100 new pages have been added. The first 90 pages are occupied mainly by useful electrical tables and mathematical data. Mr. P. H. S. Kempton deals with magnetism and electricity and with electrical measuring instruments and Professor Parker Smith with the important section (pp. 144-286) on electro-magnetic machinery and transformers. Other useful sections on measuring apparatus are contributed by Mr. G. W. Stubbings, and Mr. J. T. Irwin deals with oscillographs and wave analysis. The section on "Light and Lighting" is contributed by Mr. Mr. J. S. Dow. Important sections are those on "Power Stations" (Mr. J. Shepherd), "Distribution and Transmission" (Mr. J. R. Beard), "Switchgear" (Mr. C. C. Garrard), "Electric Heating" (Mr. Stanley M. Mills), "Electric Traction" (Mr. A. T. Dover), and "Electro-Chemistry and Metallurgy" (Mr. Barker North), whilst briefer contributions deal with such special subjects as electricity in agriculture, the electric propulsion of ships, and lifts, cranes and lifting magnets. The book is very fully illustrated and the treatment is practical and concise. A useful item in the final pages is the list of British Standard Specifications for Electrical Machinery and Apparatus, and there is an adequate index.

### Architectural Lighting

THE paper recently read by Mr. G. S. Francis, of the British Electrical Development Association, before the Architectural Association contained a suggestive discussion of the influence of tradition and thought upon both architecture and lighting. He quoted the late Bishop Creighton to the effect that somewhere about the middle of the 15th century a sharp line might be drawn. Beyond that line men thought and spoke in a manner easily understood to-day; before the line men's minds were swayed mainly by emotion and religious experience and they expressed a spirit which we to-day can only imperfectly appreciate. Men lived by faith, their minds were guided by a light outside themselves, whereas to-day they live and act more by the light of the intellect and the powers of will that are within themselves.

Originally buildings relied almost exclusively on the light of the sun and men were accustomed to a "dim religious light." To-day we are coming to rely more and more on artificial light which man himself has evolved.

Architecture, which has been described as "history in stone," has responded to this change. It is not merely that we are using new and modern materials, such as reinforced concrete and the steel frame; there is a quickening of artistic impulse arising from a desire to express the modern phase of civilization. New designs in architectural decoration and furnishing are appearing, and it is only natural that the plastic properties of artificial light should participate in this development.

Mr. Francis gave a striking description of the use of natural light as a decorative element in architectural design—the famous First Goetheanum, near Basle, a colossal building with a dome larger than that of St. Peter's and of highly original design. A remarkable feature was the use made of light from series of coloured glass windows such that the first two columns stood out in vivid emerald, and others in rose, blue and diminish-

ing shades of violet. This building was destroyed by fire in 1924 but its creator, Rudolf Steiner, is engaged upon a Second Goetheanum on an even larger scale and of equally original design.

In the latter part of his address Mr. Francis presented illustrations of many novel schemes of architectural lighting, lighting in Continental theatres, stores and restaurants. He pointed out that while occasional instances of cornice lighting, artificial skylights were met with in the past, these and other new features were embodied in a bolder way in modern architectural lighting, the origin of which might be traced to the Paris Exhibition of 1925. Masses of material of low brightness were used and brilliant spots of light avoided, and the lighting areas are introduced as an integral element in the general scheme of decoration. This mode of lighting is as yet in its infancy. Future progress depends in a large measure on the interest taken in the subject by the architectural profession.

In the discussion Mr. Howell Robertson pointed out that the high consumption of energy involved in some of these methods of lighting may sometimes prove an obstacle, and Mr. Stanley Hamp mentioned the difficulty sometimes experienced in obtaining special materials from British firms. These points were both raised in the recent discussion of Mr. Maitland's paper before the Illuminating Engineering Society. Mr. Gordon Selfridge thought that many of the schemes evolved abroad were unduly eccentric, and that something more pleasing and restrained was desired here. At the same time he thought that the desire to experiment was a good thing, and that in this country we are apt to be too cautious in taking up new things and trying them out.

The new methods have as yet been applied chiefly in the case of stores and places of entertainment, and this partly explains why the attempt to devise something original and striking has sometimes been rather overdone. But if, as we may expect, similar ideas are applied to public buildings and historic exteriors the lighting will naturally assume a more restrained and dignified form.

## POPULAR & TRADE SECTION

COMPRISING

Installation Topics—Hygiene and Safety—  
Data for Contractors—Hints to Consumers

(The matter in this section does not form part of the official Transactions of the Illuminating Engineering Society; and is based on outside contributions.)

### The E.L.M.A. Exhibit at the North-East Coast Exhibition

(Communicated by the E.L.M.A. Lighting Service Bureau.)

**A**IMING at presenting the latest in artificial lighting by electric lamps in as compact a manner as possible, the E.L.M.A. Stand at the North-East Coast Exhibition, covering a floor area of 1,000 square feet, is undoubtedly unique, and stands out distinctly from every other display in the Palace of Industry.

Since the opening day the display has been a centre of public interest, and every visitor, however conversant with modern lighting, has something to learn from the fascinating exhibits, as a special feature has been made of educational lighting demonstrations throughout the arrangement of the stand.

The stand is staffed by the lighting experts of the late North-East Coast Lighting Service Bureau, and consequently authoritative advice and information on any lighting subject can be obtained from those in attendance.

The exterior of the stand is simple in form and depends for much of its appeal on the luminous glass surfaces which form an integral part of each face. The lighted frieze running completely round the exhibit is an interesting feature and indicates the possibilities of such a method of lighting for advertising purposes. This frieze is built up of a series of square frames carrying flashed opal glass and evenly lighted by one pearl lamp per section, making a total load of nearly  $8\frac{1}{2}$  kilowatts, consisting of 212 40-watt lamps. The vertical panels on the lower part of the façade are of a purely decorative nature and add a note of colour to the display. These frames are made with a luminous opal glass background, relieved by tinted blue cathedral glass with black lettering.

Reference to Fig. 1 will show that each panel carries one letter of the initials of the Association, and it will be seen that between these panels is placed a plate glass window, the purpose of which is to attract attention and create interest by enabling visitors to obtain a view of the displays in the interior.

Over each entrance doorway an artistically designed box sign, employing lettered opal glass and 15-watt lamps, indicates the full title of the Association, while the luminous panels recessed into the arch of the doorway serve to shed a bright and inviting welcome over the threshold.

The central interior known as "The Hall of Light" is designed to indicate in a variety of forms the possibilities of architectural lighting. It will be seen from Fig. 2 that the main lighting arrangements consist of a central unit of modern design, a luminous cornice and a lighted frieze. The cornice consists of a series of luminous glass projections which are set out from a recess. This system when illuminated gives a strong bright band of light, being equipped with 48 40-watt pearl lamps, the intensity of which can be varied by the dimming device in circuit. The frieze is saw-tooth in section, and is composed of pink-tinted cathedral glass

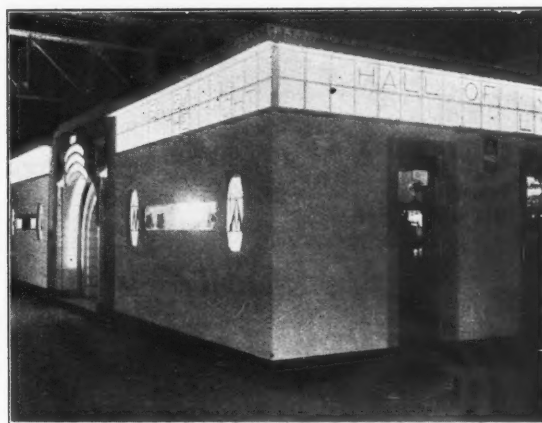


FIG. 1.—Exterior of E.L.M.A. Stand.

of a diffusing nature lighted by 60-watt tubular lamps mounted vertically behind each projection. It will be noticed that lamps installed in this manner give a series of bright spots, and in this case the effect has been deliberately introduced to give character and sharpness to the installation. The central lighting fitting suspended from the papered ceiling is of pleasing design and houses 4 60-watt lamps, 3 40-watt lamps and 2 15-watt lamps. Four display windows are incorporated in this interior, and between these displays, set vertically on the wall, are 60-watt frosted tubular lamps in simple holders, the placing of which adds considerably to the character of the interior. The four displays round the hall are as follows:—

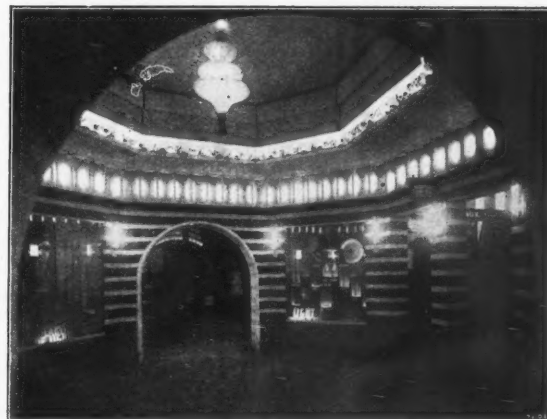


FIG. 2.—View of the Hall of Light.



1. *Lady of Light*.—Consists of a crystal figure placed on a rotating platform and illuminated by a system of coloured spotlighting.

2. *Light Throughout the Ages*.—This presents a very pleasing modern treatment of the history of artificial illumination.

3. *Luminous Ornaments*.—The growing interest in luminous ornaments for home lighting is reflected in this display, which incorporates a variety of lighted ornaments of modern design.

4. *Lamp Display*.—This effective display features the simplified range of glareless lamps, pearl and opal, the exhibit being built to represent the monogram of the Association.

Leading out from the "Hall of Light" are two interiors, the first dealing with Lighting Service work of the Association, and the second with various applications of lighting to the home, the factory, and the office. A view of the Lighting Service interior is shown



FIG. 3.—The Lighting Service Interior.

in Fig. 3, and it will be seen that here again modern lighting is provided in the form of flush luminous ceiling panels and geometrically shaped fittings. Displays in this interior consist chiefly of effective miniature lighting demonstrations, and the very complete model "All Electric House" arouses great interest among all visitors.

The other interior, showing various applications of modern lighting, is designed to enable full-sized demonstrations to be given to visitors. Luminous indicator signs are installed throughout the stand and the visitor has no difficulty in finding the various sections, while every use has been made of flashing devices and message bearing signs to render the lighting displays more interesting and capable of telling their own story.

### Sheffield Illumination Society

A party consisting of members and friends of the Sheffield Illumination Society paid a visit to the Nunnery Colliery, Sheffield, on the 29th May, and were conducted through some of the underground workings.

The party was shown the various precautions taken against explosions, and the ventilating system was fully explained by competent guides. The geology was studied and the seam traced to the coal face, where the coal was being mined with the aid of compressed air drills. It was also explained how explosives were used to bring down the coal, and to "rip" the rock.

As the majority of the members had not previously been down a mine, the experience was, in spite of the dust and heat, most enjoyable, as well as being particularly instructive.

No doubt the familiarity of the visitors with public lighting suggested to their minds some speculations on the lighting of coal mines—possibly an even more difficult problem than the lighting of streets, and one that has certainly been very imperfectly solved as yet.

### Photographic Copying by Artificial Light

The introduction of actinic copying lamps is another example of a case where artificial light has material advantages over daylight. The artificial source has the merit of constancy, whereas daylight varies greatly according to the time of day and period of the year.

For photographic copying the enclosed arc, with an arc-length of 2 to 2½ inches is now widely used, being in fact actually more efficient for this work than average daylight. The operation of such lamps is a very simple matter, and a number of compact types have been introduced by Messrs. Korting & Mathiesen Electrical Ltd. For the illumination of photographic copying machines employing sensitive tracing paper the lamp is usually applied without any reflector, but for vertical printing frames a special reflector may be added. Probably, however, the form of lamp most widely used is the "Ellipsoscope," which is intended for the illumination of horizontal frames and is shown in the adjacent illustration. With such lamps the exposure is usually only one-sixteenth to one-fourth of that needed under daylight conditions.



Showing "Kandem" Ellipsoscope printing outfit in operation.

The standard lamps operating at 10 or 15 amps. d.c. or 12 or 18 amps. a.c., and designed to receive 150 to 160 volts, are much used by firms who make a speciality of copying work. But a smaller and more compact lamp, consuming only 5 amps. on d.c. and 6 amps. on a.c., and therefore capable of being operated on the ordinary lighting circuit, has now been introduced. Standard resistances or chokers can be furnished to enable these lamps to be used on either 110 or 220 volts. It is thought that this form of lamp will prove of considerable service to architects, engineers, patent experts and others who only require the illuminant for occasional work. Blueprints can be readily obtained with an exposure of only 3½ to 4 minutes.

### Mr. F. W. Purse

#### A NEW APPOINTMENT.

We learn with interest that Mr. F. W. Purse, Engineer and Manager to the West Ham Corporation Electric Supply, has accepted the appointment of Chief Engineer to the London and Home Counties Joint Electricity Authority. During his ten years service at West Ham, Mr. Purse has become one of the best known figures in connection with electric supply, and has taken an active part in the work of the Institution of Electrical Engineers, the I.M.E.A., the E.D.A., and other bodies.



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## Coloured Floodlighting at the North-East Coast Exhibition

One of the principal attractions of the great business Exhibition at Newcastle-on-Tyne is the striking coloured floodlighting of the buildings and grounds. White floodlighting, illuminating business premises, is now a comparatively familiar sight, but the introduction of colour in the spectacle presented at the North-East Coast Exhibition is something new.

The scheme, which is believed to be the most

effects in the floodlighting of the Palace of Engineering and Palace of Industries include all the hues of the rainbow, producing some remarkable and artistic contrasts.

A number of interesting photographs showing the floodlighting are reproduced on this page, but these, being monochrome, naturally cannot give an adequate impression of the actual effects.



FIG. 1.—A view of the Main Avenue showing the Palace of Engineering and the two towers colour floodlighted by B.T.H. equipment.



FIG. 2.—A view from the Avenue at the opposite end showing the Palace of Industries with B.T.H. colour floodlighting from projectors in spherical lanterns mounted above the lighting standards on the roadways.

extensive and effective scheme of coloured floodlighting ever attempted in this country, should contribute in no small measure to the success of the Exhibition. Thousands of visitors have been assembling to watch, at dusk, the switching on of row upon row of floodlight projectors from which coloured beams of light flash

We hope to publish in one of our next issues some fuller details of this floodlighting scheme and of the Giant Mazda illuminated fountain which furnishes another illustration of the possibilities of coloured floodlighting.

The whole of the floodlighting scheme was arranged by the British Thomson-Houston Co., in conjunction



FIG. 3.—A view towards the pylons showing the colour floodlighted Palace of Engineering in the foreground and the rows of B.T.H. lighting standards at the top of which are mounted special spherical lanterns containing the floodlight projectors.

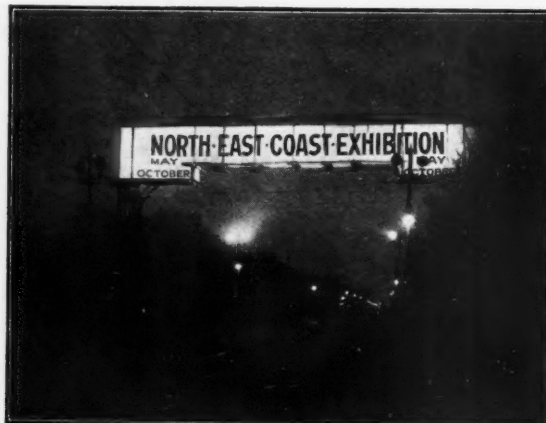


FIG. 4.—A view showing the large sign spanning the roadway. This sign is also floodlighted by B.T.H. equipment, as is every building and structure throughout the Exhibition.

out, until within a minute or two the whole of the Exhibition buildings and the grounds are bathed in soft multi-coloured light. In the general floodlighting colour scheme amber predominates, while the colour

with the Consulting Engineers, to the approval of the architect, Mr. Millburn, and B.T.H. floodlight projectors with Mazda gasfilled lamps are employed throughout.

## Plant for Artificial Lighting of Farm Premises

An enterprising step has been taken by the British Dairy Farmers' Association, which, in order to encourage farmers to install artificial lighting in ordinary farm premises, has decided to offer prizes for suitable plant at the forthcoming Dairy Show.

The show will be held at the Royal Agricultural Hall during October 22nd to 25th. The exhibit of artificial lighting comes in Class B, and involves lighting from

fixed points. The first prize is £3 and a silver medal, the second £2 and a bronze medal. We hope that makers of plants will take advantage of this opportunity of illustrating the applications of artificial light in farm premises. There is no doubt that considerable opportunities in this direction already exist, and it is usually found that once plant has been installed in a section of a farm its application is extended elsewhere.



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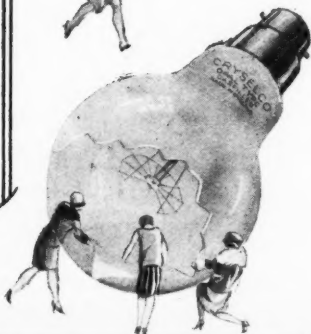
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## Floodlighting in Prague

### Some Striking Examples of the Illumination of Historic Buildings and Monuments

BY the courtesy of the Spravni Rada Elektrických Podniku Hlavního Města Prahy (The Electrical Enterprises of the City of Prague), we are reproducing some charming photographs illustrating the floodlighting of this old and historic city. This special festival lighting was installed to celebrate the tenth anniversary of the foundation of the Czechoslovak Republic last year, but we understand that the effects met with such general appreciation that the essential features of the installation will be retained as a permanent feature. In all about 600 kw. was required to effect this floodlighting. It will be agreed that it greatly enhances the appearance of the city by night.

The use of light on occasions of national rejoicing is a practice of very ancient origin, but these pictures should serve to show how much we have progressed beyond the somewhat crude display of illuminated crowns and mottoes, executed in coloured lights, in the past. In the modern methods of illumination the light source itself is unobtrusive. It serves merely to reveal the natural beauties of a city. The view of the old Town Hall and Church of Our Lady in Fig. 2 is particularly pleasing, whilst Fig. 4 affords a good instance of what floodlighting can do to improve the appearance of a riverside.

The City of Prague is famed for its churches and historic buildings, many of them of very early date and having distinctive architectural features seldom seen. It therefore furnishes an excellent illustration of what floodlighting can do to reveal architecture of this kind. It is significant that, whilst this floodlighting was originally installed to mark a special occasion, the essential part of it is to be retained permanently for the benefit of visitors to this quaint old city.

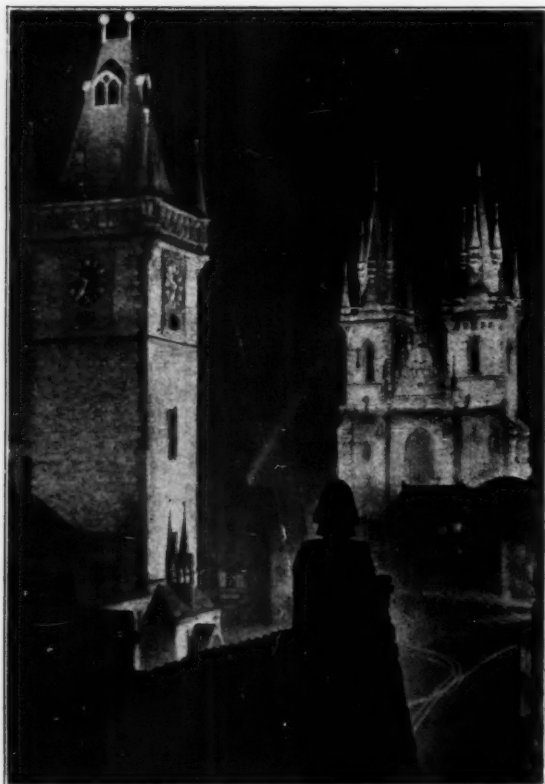


FIG. 2. Tower of the old Town Hall and Church of our Lady (A.D. 1511).

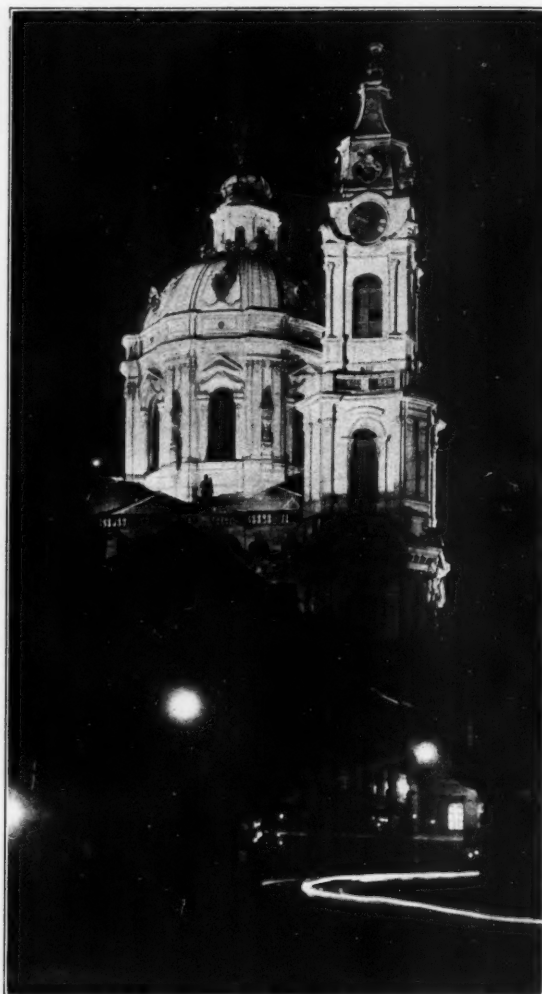


FIG. 1. St. Nicholas' Church. A jewel of Baroque Architecture (Seventeenth Century).

For such purposes it is probable that most people would prefer to adopt floodlighting with ordinary white light, or possibly white light that is only slightly tinted. But for special occasions, when spectacular effects would not be out of place, there are great possibilities in the use of coloured light, especially in parks and gardens, and at exhibitions, fêtes, etc.

In this country floodlighting has hitherto been associated mainly with the lighting of commercial buildings, leading stores and places of entertainment. These pictures should serve to show that it has other possibilities. We believe that in course of time municipal authorities will regard the use of light to enhance the appearance of their city by night and reveal its historic buildings as a natural and proper duty. The conception of "public lighting," at present used to convey merely the more or less adequate lighting of the streets, is already coming to have a broader meaning. It now embraces such special applications of light as the installation of illuminated traffic signs, illuminated street refuges, etc. Ultimately it may well come to denote the exterior lighting of a city as a whole and to include the regulation of illuminated signs, the use of lighted house-names and numbers, and the illumination of buildings, parks, bridges, etc., so that citizens will find that at night their city takes on new beauties, and many things are revealed which escape notice during the daytime.



FIG. 3. A view of the old Town Bridge Tower: in the background the Monastery of the Crucigerous Knights, with St. Francis's Church.



FIG. 4. The Charles Bridge, built in the Fourteenth Century.



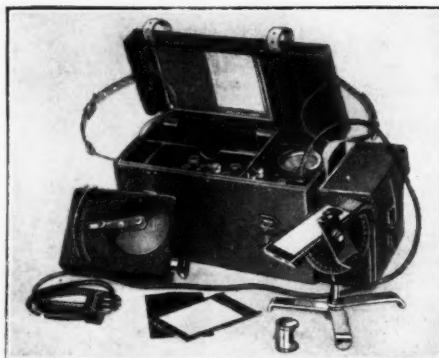
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It is hoped that the increased facilities will be of great assistance to local trade. The adjacent illustration shows a view of the new premises.



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